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Harmonious Environmental Management of Cultural Heritage and Nature

By

Chien-Nien Chen (Otto Chen) BSc, MSc

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in accordance with the requirements of the degree of Doctor of Philosophy
in the Faculty of Engineering

Department of Civil Engineering

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One night a man had a dream.
He dreamed he was walking along the beach with the Lord.
Across the sky flashed scenes from his life.
For each scene, he noticed two sets of footprints in the sand:
one belonging to him and the other to the Lord.

When the last scene of his life flashed before him,
he looked back at the footprints in the sand.
He noticed that at the very lowest and saddest times in his life,
there was only one set of footprints.

This really bothered him and he questioned the Lord about it.

The Lord replied, "My precious child, I love you and I would never leave you.
During your times of trial and suffering,
when you see only one set of footprints,
it was then that I *carried* you."

To the Lord

ABSTRACT

Currently, there is a lack of substantial integration in considering both natural and heritage environment with respect to managing change in either heritage conservation or environment protection. The failure of achieving harmonious environmental management can hence often be seen, leading to conflicting situation or even irreversible loss. This study therefore seeks to develop a framework/methodology for ‘Harmonious Environmental Management of Cultural Heritage and Nature (i.e. water environment particularly)’, to simultaneously mitigate the existing knowledge gaps in both domains, through a holistic view that is scarce in literature.

The study primarily examines the issues from values-based theory, minimal intervention theory, the dichotomy between culture and nature, and the conduct of Heritage Impact Assessment (HIA), all play critical roles in managing change whilst they are either narrow in considerations or confined to some extents, leading to the inadequacy in application and the incapability to catch up with the latest revolution of heritage conservation that features broadening the lens to people and nature, rather than merely the fabric.

The research proposes some novel perspectives and approaches, through the explorations from the sphere of philosophy, theory, practice, to application sphere, presented respectively as four chapters. Moreover, it covers different temporal (past, present and future) and spatial (regional and global) scales, as follows: 1) for the past, the regional pluralism of heritage conservation is echoed. It explores the philosophy of ancient Chinese regarding the interaction between people, nature and built world, as well as accommodating changes, as the underlying core concept—harmony—for the rest chapters; 2) for the present, a more comprehensive intervention approach featuring matrix thinking covering heritage, nature and people sphere is developed. Followed by examining the emerging issues in conducting HIA that has troubled the world: 3) the incompatibility of HIA within Environmental Impact Assessment (EIA), which portrays four patterns of statutory system from global lens, and proposes a HIA approach in response to the troublesome discourse; and 4) for the future, a participatory decision-making support method is developed for environmental planning involving water cultural heritage and nature, which is also a manifestation of the applicability of the proposed matrix approach. The integrated method tackles a real dilemma case in a historic town of Taiwan, with a scarce function of scenario forecasting to address the condition of the context. This part is presented as a more pragmatic and quantitative complement to the conceptual developments in the previous parts, for rounding out the whole exploration towards harmonious change management.

Keywords: Buddhism; community engagement; Chinese cultural heritage; Confucianism; Contingent Valuation Method; cultural pluralism; Daxi togan; Heritage Impact Assessment; Huaqing Palace; *I Ching*; Minimal Intervention; multi-criteria decision analysis; resilience; setting; sustainability; Taoism; water heritage

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's *Regulations and Code of Practice for Research Degree Programmes* and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

SIGNED:DATE:.....

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LIST OF ABBREVIATIONS

AHD	Authorised Heritage Discourse
AHP	Analytic Hierarchy Process
BOD	Biochemical Oxygen Demand
CBA	Cost-Benefit Analysis
CDA	Critical Discourse Analysis
CIA	Cultural Impact Assessment
CMD	Cubic Meter per Day
CVM	Contingent Valuation Method
DIS	Dujiangyan Irrigation System
EIA	Environmental Impact Assessment
EH	English Heritage
HIA	Heritage Impact Assessment
HUL	Historic Urban Landscape approach
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICH	Intangible Cultural Heritage
ICOMOS	International Council on Monuments and Sites
MCDA	Multi-Criteria Decision Analysis
NGO	Non-Governmental Organisation
NEPA	National Environmental Policy Act (US EPA)
NHPA	National Historic Preservation Act (US)
OUV	Outstanding Universal Value
SIA	Social Impact Assessment
UN	United Nations
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
WH	World Heritage
WTA	Willingness To Accept
WTP	Willingness To Pay

Chapter 1 Introduction

1.1 Background and Motivation

When an environmental management issue simultaneously involves built environment and natural environment, it is very often a challenge to the manager or decision maker; let alone an issue involving cultural heritage and nature, of which the conservation philosophies are usually considered more rigorous and distinct. In my fifteen-year engineer career before the pursuit of this PhD degree, I have experienced working in restoration project of historical architecture for quite some time and working in environmental protection project for more than half of the period. Being different roles serving different clients makes me take it for granted that conserving heritage, maintaining built environment, and protecting natural environment inevitably apply different philosophies and principles. However, at later stage of my career I have experienced some projects involving cultural heritage and nature environment, by which I was always shocked to see such considerable conflicts and misunderstandings in achieving the best of both, as two sides are usually deemed as independent and seemingly irrelative. So I started to wonder whether they should be considered together or not, and whether the relationships and bonds between them are important with respect to ideology and should therefore not be overlooked, particularly in terms of heritage conservation and management of change. Moreover, the challenge of finding harmony between heritage and nature in environmental management seems rather complex, which involves theoretical, methodological, statutory, legislative and even political difference and issues in both sides. With the increasing awareness of the public towards heritage conservation and environmental protection, as well as the impact of climate change, the management of change involving heritage and nature starts to show its importance and demand in recent decades. Therefore, I found this issue worth further exploring, which inspired me to do this PhD research.

Heritage conservation and environmental protection usually hold different perspectives and languages, and usually are conducted separately, regardless of the fact of interactive and interdependent relationships between them. World Heritage is such an example, as an iconic model of global conservation practice, Taylor and Lennon (2011) point out that although lots of efforts and changes have been made by the convention thus far due to the acknowledgement of the importance of the foregoing relationships, there is still no satisfactory enhancement of

understanding and integration towards the bond between natural World Heritage and cultural World Heritage, which means the system has not been able to achieve adequate interdisciplinary dialogue between the two sides. Similar situation exists in practice of environmental management at all levels, international, national and local; one can often see failures in pursuing harmonious consideration and resolution towards heritage and nature. We cannot help but think there might be some knowledge gaps and inappropriate perspectives existing in or between the two sides, theoretically and practically, such that a substantial improvement has not been achieved for a long time. This is the fundamental question this research is going to explore.

Following the foregoing fundamental question, I firstly tried to understand relevant issues from each side/realm respectively. There exist some long-standing debates and issues in both sides regarding the disharmony and dichotomy between heritage and nature in environmental management, specifically, in the management of change. From the environmental protection side, for instance, the lack of introducing Social Impact Assessment (hereinafter referred to as SIA) and Cultural Impact Assessment (CIA) into the conduction of Environmental Impact Assessment (EIA) has been debated for decades (Vanclay, 2003), which implies the narrow consideration of EIA that only revolves around nature aspect tends to regard nature as merely resources to be protected, mainly for human to use and consume as long as possible. It reveals EIA usually ignores possible impacts on social and cultural sphere. However, natural environment is something more than merely resources; nature has a variety of meanings and relationships to people, as well as to heritage, which is something that people create for living in the nature/world. This issue appreciably affects Heritage Impact Assessment (HIA) of the other side. As we can see the formation of mainstream that countries with statutory requirements of conducting HIA within EIA for the sake of achieving better protection on both nature and heritage, however, it seems the current systems are somehow incompetent to apply the lens of heritage value/significance to the overall ensemble of attributes, and the performances so far are far from satisfactory (ICOMOS, 2011; Roders, 2011). We cannot help but wonder whether the current EIA system, with the attitude of sectionalism, has misled attached HIA into a paradigm that also deems heritage as merely resources, and whether the paradigm resulted in a fundamental obstacle to the protection of heritage related community, society and intangible sphere, which nevertheless have been acknowledged their importance in heritage conservation in the latest two decades (Byrne, Brayshaw, & Ireland, 2003; Smith, 2006, 2015; Waterton & Smith, 2010). Without considering people and social sphere, the

understanding of the connection between heritage and nature in the EIA-based environmental management system is inevitably narrow and limited, which may more easily lead to some important impacts pass undetected.

As to the heritage conservation realm, there also exist some notable issues regarding harmonious environmental management. For instance, the tendency of dichotomy between culture and nature (Taylor & Lennon, 2011), overlooking the relationship between people and nature in heritage conservation (Byrne et al., 2003; Smith, 2006), the inapplicability and inadequacy of theory and practice regarding the management of change based on minimal intervention theory and values-based approach (Poulios & Sites, 2010), and issues in conducting HIA within planning system (Bond et al., 2004; Brown, 2008; King, 2000; Pendlebury, 2013). Notwithstanding these issues have started to draw more attention respectively in heritage conservation in the last two decades, they are considered as independent issues and have not been systematically explored together. However, from the perspective of environmental management, these issues are all interrelated causes. What reveals here is the fact that the management of change in heritage conservation still revolves around heritage itself, rather than considering the relationships and bonds with nature and people. In addition, the current HIA methodology of global heritage practice reflects the fact that HIA does not cover the main concerns of SIA (i.e. social influence, social significance) and only cover the tangible culture (ICOMOS, 2011). In other words, only the physical status and intrinsic value of heritage fabric is concerned within the current HIA approach (Patiwael, Groote, & Vanclay, 2018). It means the current methodology separates cultural heritage from people and nature. We cannot help but wonder whether this division to a large extent echoes the issues of resource-oriented EIA aforementioned in last paragraph, and wonder how it can be possible that this narrow and limited HIA approach from heritage side will break through the obstacle of dominant EIA so as to achieve improvement in the future.

From the understating of the relevant issues of the both sides, I realised there are some discussions still lacking, which can be the key for fundamentally improving environmental management and hence are worth doing research. Firstly, from heritage conservation side, it is still lacking discussions regarding management of change, in a more systematic and comprehensive way involving all those relevant issues mentioned in the last paragraph. There is still lack of exploration about what knowledge gaps or inadequate perspectives make the management of change fall behind the development of heritage conservation. Secondly, from environment domain, notwithstanding there exist some literatures discussing the issues of

implementing HIA in EIA system, there is still lack of discussion about how EIA perspective misleads HIA into a disadvantageous paradigm, and lack of exploration about how EIA-based statutory system affects HIA. Thirdly, it is also scarce to find interdisciplinary research regarding the management of change involving culture heritage and nature, through comprehensive discussions from the both realms, ending up with a proposal of methodology. It is expected to provide a more inclusive and in-depth way of thinking underpinned by the relationships and bonds between nature, people and heritage, as it is the core value and prerequisite of harmonious environmental management. These three points are expected to offer novel features to this research. As there are increasing demands in the present and future in dealing with the contest between heritage, nature and human activities, the author sincerely hopes to not only fulfil some knowledge gaps in this regard, but also use the proposed methodology to stimulate and encourage more discussion, in both theoretical and practical sphere.

1.2 Scope and Aim

This study aims to develop a methodology for ‘Harmonious Environmental Management of Cultural Heritage and Nature (i.e. water environment particularly)’, for the purpose of simultaneously conserving both. However, instead of merely heritage and nature, the methodology must revolve around three targets, namely heritage, people, and nature, in order that comprehensive consideration to be achieved. Rather than regarding ‘nature’ as merely an external influencer (e.g. flood) or another irrelevant resource nearby that is worth being protected, ‘nature’ here highlights the relationships and bonds between nature and people, and that between nature and heritage, as the concern and significance of the relationships with nature have long been overlooked in the theory and practice of heritage conservation without adequate awareness. The research explores the situation and its adverse influence in heritage conservation, as well as in the management of change, so as to manifest and highlight ‘nature’ is essential in heritage conservation and it should not be left to the field of environmental protection. As to ‘people’ (i.e. ‘context’ in the matrix), it refers to community, social significance, society, and even the public that are related to heritage. As aforementioned in last section, although the importance of these people aspects has been acknowledged in heritage conservation in the latest two decades, it has not been put into consideration in the management of change (i.e. HIA). However, it is by no means a delay of development, this research proves there are some knowledge gaps and inadequate theories in heritage

conservation obstructing its improvement, which has never been discussed in existing literature. Therefore, through interdisciplinary discussions in both environmental protection and heritage conservation, as well as the development of a novel matrix perspective, all these complex and interrelated issues of 'nature' and 'people' are systematically analysed, which is expected to be the key for fundamentally improving the management of change involving heritage and nature.

To this end, the research firstly needs to identify key research questions, and then followed by several steps/parts of research to acquire the answers and resolution. The key research questions are as follows:

- I. What is the significance of the harmony?
- II. What are the causes that separate culture heritage from nature and people, in the realm of heritage conservation and environmental protection?
- III. How to make a more comprehensive and inclusive consideration in management of change, in respond to the knowledge gaps and inadequate perspectives if exist?
- IV. Once the new perspective/methodology is developed, how to manifest its aptitude and applicability?

As to the first question, the research attempts to explain why harmony is not merely a way to describe the good and simultaneous protection towards cultural heritage and nature. Beyond the literal meaning, more importantly, harmony here highlights the understanding of the relationships and bonds between nature, people and heritage, as it is the value of cultural heritage and the prerequisite of harmonious environmental management. To this end, the research intends to manifest that harmony composes a fundamental ideology for the sake of good performance in heritage conservation, particularly in management of change.

Therefore, in the first part of exploration, the research revolves around the meaning and ideology of harmony. When it comes to harmony, some people may think of some philosophies of ancient Chinese, whilst these philosophies have not been scholarly connected to cultural heritage. It is hence worth rediscovering the role and meaning of harmony in ancient Chinese, through the discussion of four schools of thought to see how they shaped the idea of cultural heritage in the ancient minds.

After a long-standing debate of pluralism in heritage conservation (De Cesari, 2010; ICOMOS, 1994; Pendlebury, Townshend, & Gilroy, 2004; Tomaszewski, 2002), the global practice has just started to broaden its view from fabric to people and even to nature, leading to the potential of a more comprehensive understanding and harmony between these spheres.

Notwithstanding the shift from fabric to people and then to nature seemingly looks like the only path in modern heritage conservation movement to achieve the goal of harmony, in fact, there exist some regional cultures that originally feature peculiar views on human-nature harmony. This part of the thesis hence highlights the regional difference in heritage with a focus on ancient China, which unfolds the peculiar perspective emphasising the unity of human and nature. With a case study of Huaqing Palace of the Tang Dynasty (618 to 907 CE), the chapter is expected to be the first attempt to rediscover that the four schools of thought, Buddhism, Taoism, Confucianism, and *I Ching* had jointly formed a value system of ancient Chinese in shaping the idea of cultural heritage, as well as the idea of heritage conservation. Since the development of heritage conservation of China in the modern heritage conservation movement is behind European countries, China is too eager to catch up with the trends and steps of these leading countries to forget the splendid characteristics about harmony that it once had in thought. The chapter therefore argues that without understanding and acknowledging the significance of ancient Chinese's peculiar view on nature and the universe formed by the four thoughts behind the fabric, it is not likely to comprehensively protect and promote their heritage value, such that the importance of cultural diversity will be just rhetoric. The chapter is expected to bring some additional contributions to heritage conservation in this regard.

As to the second and third question, as aforementioned that nature has long been overlooked in heritage conservation, and that nature and people have been ignored in the management of change (in heritage conservation) (e.g. HIA methodology), the research intends to find out whether there are knowledge gaps and inadequate perspectives. Therefore, the second part of exploration, presented as one chapter, explores the current issues related to management of change from heritage domain, including the tendency of dichotomy between culture and nature, overlooking the relationship between people and nature in heritage conservation, and the inapplicability and inadequacy of minimal intervention theory based on values-based approach, which principally makes discussion from the aspect of intervention, with management and conservation measure as the internal influencer. It means the changes of this aspect are active and caused by interventions that are for the purpose of conserving and managing heritage, rather than the changes/impacts caused by external factors such as development (i.e. HIA).

The chapter employs the underlying findings and inspiration from the first part of exploration, namely the harmony of the four thoughts, for further developing a matrix

methodology, which is expected to provide a more comprehensive and inclusive way of thinking regarding intervention than current theory. In order to better address the ideology of harmony in heritage, people and nature, through the exploration of water heritage, an overlooked category with diverse dimensions, the chapter manifests that water heritage can better help conceptualise the matrix methodology encompassing the three targets, and that the three targets are all essential and necessary in heritage conservation, as well as in management of change. In other words, the discussion of water heritage, coupled with water heritage case studies, help reframe the idea of intervention, from a narrow values-based view focusing on the authenticity of fabric, to a more broad and inclusive perspective simultaneously considering the aspect of value, sustainability and resilience, and targeting/covering heritage, context (i.e. people and society) and nature.

The third part of exploration is also in response to the second and the third research question, whilst the discussion is mainly from the aspect of external influencer, namely HIA, which is a management practice principally developed from intervention theory and values-based theory. The chapter attempts to explore the issue of conducting HIA within planning system from heritage domain, as well as the issue of conducting HIA in EIA framework from environment domain. The research argues that EIA system has misled attached HIA into a paradigm that fundamentally obstruct the protection of heritage related community, society and intangible sphere. From heritage domain, the research also argues that the current narrow and limited HIA methodology involves with Authorised Heritage Discourse (AHD, explained in Chapter 2), such that it cannot break through the obstacle of dominant EIA to achieve improvement. Therefore, in order to fundamentally tackle the issues of HIA, the chapter encompasses two parts; first part intends to discuss issues in statutory system, whilst the second part intends to develop a new HIA methodology based on the matrix perspective proposed from the previous chapter. Through the investigation towards HIA statutory system of the five representative countries (Australia, Canada, China, the UK and the US) and the analysis of the systemic problems, the first part explores the multiple discourses that significantly mislead the existing HIA paradigm, which is expected to have potential to contribute to many countries globally. On the other hand, the second part proposes a new HIA methodology with more inclusive consideration on the respect of intangible, social significance, community and nature, followed by a case study of Angkor WH water heritage as the manifestation of the proposed approach.

In response to the fourth research question, as this research seeks to propose a methodology that is applicable and adequate in providing comprehensive consideration regarding the management of change, therefore, the methodology should not only be applied as a substitute for the current intervention theory and HIA approach, it should also be able to accommodate other management tools and approaches regarding environmental management and be able to show a better performance it leads to, particularly in a real case of complex environmental problem involving cultural heritage and nature. To this end, the last part of the exploration of the thesis, also presented as a chapter, seeks to manifest the aptitude and applicability of the proposed matrix, with a real case involving decision making dilemma. Also, it manifests why the context is highlighted in the proposed matrix, rather than merely heritage community that has been emphasised in recent heritage conservation.

Multiple criteria decision analysis (MCDA) methods have been shown to be potentially very useful for supporting decision-making of problems that confront conflicting objectives. However, the current applications involving heritage and nature do not fully reflect this potential. To tackle environmental complex problems with MCDA, the prediction towards the scenarios/consequences caused by hypothetical implementation of the plans is inevitable, which is considered as the weakness and discouragement in conducting MCDA involving social impact (Daron & Colenbrander, 2015; Lehtoranta, Seppälä, & Kosenius, 2013; Turpie, MANDER, & JOUBERT, 2000). It means that the scenario forecasting has not been paid much attention in MCDA research, whilst in water heritage realm that is prone to involve environmental complex problem can no longer ignore this demand. To this end, a participatory MCDA method is hence proposed in the chapter as a merger with the stated preference method of economic valuation, which features an integration with the matrix perspective proposed in previous chapter so as to acquire better informative support from the policy recipients and the public (i.e. ‘context’ of the matrix). The chapter demonstrates that applying the proposed participatory MCDA can better tackle the dilemma, a complex environmental problem involving cultural heritage and nature in a historic town Daxi in Taiwan, as the underlying matrix perspective can well address ‘social significance’ in this case. The research outcome manifests the author’s argument that social significance—how much money the public are willing to pay to support the cultural heritage in the case—can decisively influence the final decision, which shows the advantage of the proposed matrix that highlights people aspect (i.e. as ‘context’ of the matrix) and the bonds between heritage, people and nature, for achieving harmonious environmental management.

1.3 Thesis Layout and Structure

The layout and structure of this thesis are briefly depicted in Figure 1-1. This PhD research aims to comprehensively explore the issues of harmonious environmental management involving cultural heritage and nature, which therefore encompasses four parts of exploration: first part, presented as Chapter 4, to rediscover harmony ideology of ancient Chinese as the underlying construct for the development of methodology (i.e. the matrix) in the successive chapter; second part, presented as Chapter 5, to develop the matrix methodology for the improvement towards intervention in heritage management; third part, presented as Chapter 6, to fundamentally examine HIA conduction, through the analysis of statutory system and the development of a new HIA approach; fourth part, presented as Chapter 7, to show the applicability of the proposed matrix methodology to accommodate other management tools, and manifest the aptitude and advantage of the matrix methodology by tackling a real environmental dilemma.

On the other hand, from temporal and spatial sphere, the thesis also features comprehensive coverage. The first part (Chapter 4), for the past, centres on the relationship between cultural heritage and nature, and highlights the regional pluralism of the idea of cultural heritage, with focus on the ancient philosophies behind Chinese cultural heritage. This part also contributes to the past sphere of heritage conservation by enhancing the understanding of Chinese heritage and its value, as well as the understanding of the idea of heritage. The second part (Chapter 5) and the third part (Chapter 6) are mainly for the present and in global scale, for dealing with the issues of change or intervention in environmental management. Chapter 5 contributes to the theory realm of heritage conservation by developing a more inclusive intervention perspective with a more comprehensive consideration in nature and people sphere. Chapter 6 contributes to the practice realm of heritage conservation by addressing the incompatibility of HIA with EIA and by proposing a new HIA approach particularly with sustainability and resilience aspect that have been neglected in values-based theory. The last part (Chapter 7) addresses future sphere. It develops a participatory MCDA tool for supporting decision-making, which features scenario forecasting and social significance that are based on the proposed matrix perspective in previous chapter. The proposed integrated method shows its aptitude and applicability in tackling a real environmental issue in local scale that requires detailed consideration.

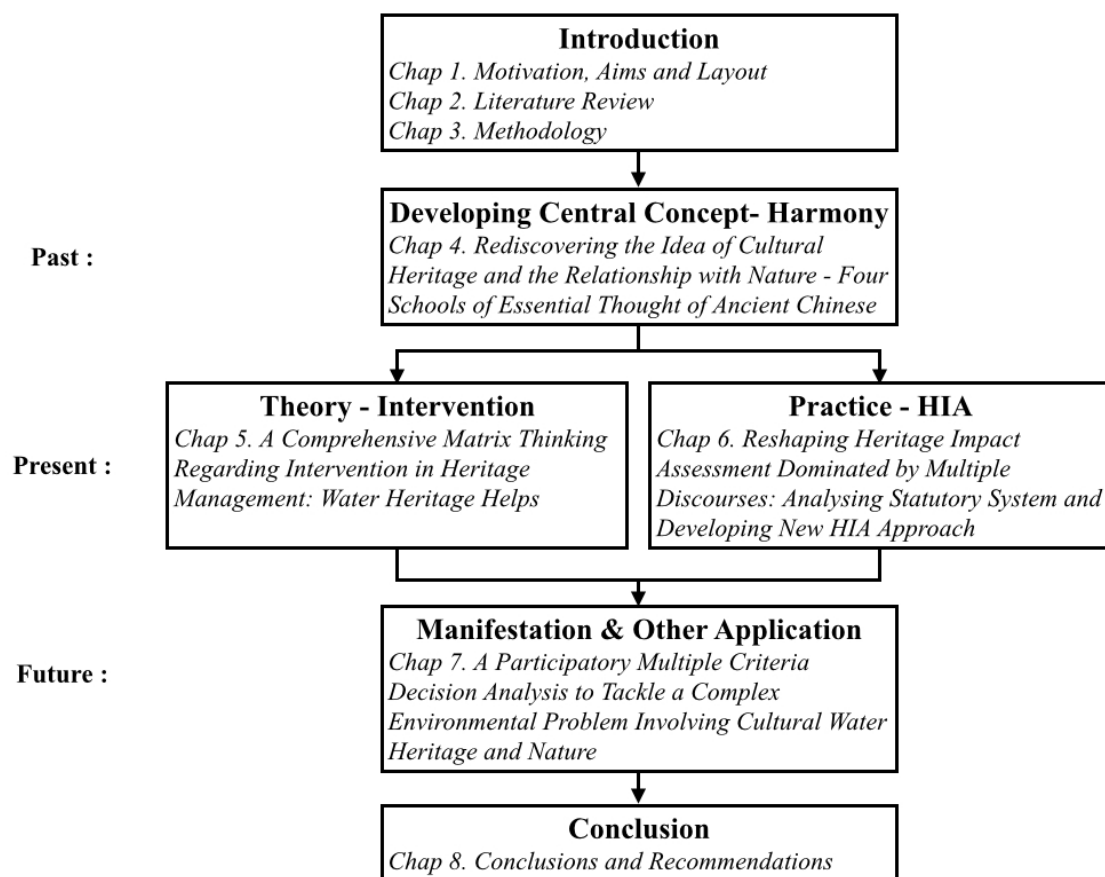


Figure 1-1. Thesis layout and structure.

Chapter 2 Literature Review

As mentioned in Chapter 1, the thesis seeks to make in-depth discussion in terms of harmonious environmental management, therefore, interdisciplinary discussion is necessary, mainly between heritage conservation and environmental protection realm. From heritage domain, as heritage conservation and management is particularly sensitive to changes, there have been some theories and approaches developed for managing change. Although there exists some literature regarding aforementioned theories and approaches, so far, they are discussed respectively, such as the issue of values-based approach, of intervention theory, of HIA, and some discourses that involves management of change (e.g. Authorised Heritage Discourse). Since these relevant theories, approaches, practice and discourses are critical to the exploration of this research topic, the research therefore needs to review all of them.

In order to facilitate readability and understandability of the thesis, this chapter plans to start from a principal theory of heritage conservation—values-based theory, for one hand to understand the critical difference of value between heritage domain and environment domain, and for the other hand to explore how it affects other theory and practice regarding management of change in heritage conservation, namely intervention theory and HIA, which follow the first review section. Then the chapter attempts to review some relevant discourses. It is because the evolution of heritage conservation has reflected on the emergence of important dissonances and discourses, yet these dissonances and discourses need to be engaged in the later discussions of the thesis, some as supportive points for manifestation, whilst some as prominent issues to be avoided. Followed by the review about sustainability and resilience, as these two aspects are the key elements of the methodology proposed in the research.

2.1 Values-based Theory

A values-based theory (i.e. the values-led approach referred to by WH system (Unesco & Icomos, 2013)) has been developed since the 1980s, within the development of an archaeology theory that encourages conservation practitioners to recognise other values, interpretations and perspectives in the practice of archaeology (Hodder & past, 1991; Poullos & Sites, 2010; Trigger, 1989). The two principal contentions, that values are primary purpose of the conservation of cultural heritage, and that placing people and different values ascribed by various stakeholders at the core of conservation, have consequently been widely debated in

recent decades; it is then adopted and considered as the current most preferred approach in heritage conservation (Poulios & Sites, 2010). Current methodology focuses on values—their identification, description and prioritisation—with the significance of an cultural resource derived as a product of these discrete values (Walter, 2014). Riegl (1903) describes a system of values of heritage and contends the values as ‘the first coherent basis for modern conservation theory’. Architectural conservation theorist, Jukka Jokileht (2007), contends that values are the key issue in modern conservation theory and practice, which are likely to have a significant influence over cultural heritage and all those charged with its planning, management, future development and use.

Values have also been explored in many organisations and conferences of international level (e.g. UNESCO, ICOMOS, ICCROM, Getty Conservation Institute) and have become the principal concern of these international organisations and charters (e.g. Outstanding Universal Values of World Heritage Convention, Burra Charter (ICOMOS, 1999)), which inevitably reinforces its position in global practice of heritage conservation. The Getty Conservation Institute regards the values-based system as axiomatic (Avrami, Mason, & de la Torre, 2008; De la Torre & Throsby, 2002):

Conservation decisions – whether they are concerned with giving a building ‘heritage’ status, deciding which building to invest in, planning for the future of a historic site, or applying a treatment to a monument – use an articulation of heritage values (often called ‘cultural significance’) as a reference point. Assessment of the values attributed to heritage is a very important activity in any conservation effort, since values strongly shape the decisions that are made ... (Mason, 2002)

The above passage reveals how values are considered as the most important thing in conservation, particularly engaging in every part of conservation, including the management of change. In terms of management of change, the values-based approach therefore underlies the development of intervention theory and HIA approach, of which the influences are discussed in section 2.2 and 2.3 respectively.

The current concept of the values-based theory has been shaped and evolved by debates through numerous academic and professional publications addressing both theoretical and practical respects. According to de la Torre, he observed that the values-based approach is prone to lead to an increased power of conservation professionals, of which in the context the priority is mostly given to the preservation of the fabric and tangible heritage elements. He addresses in his case studies:

while the values and significance of a place ought to be the touchstone of management decisions, day-to-day operations are most often concerned with the use and care of the physical resources... (Myers, MacLean, & Mason, 2005)

During the evolution of the theory, there was a remarkable change in heritage conservation shifting from regarding heritage values as intrinsic, self-evident and stable values, to extrinsic, ascribed and mutable values. As values are identified and ascribed by stakeholder groups, of which the values are often of conflict; the values-based approach does not provide sufficient ways and account to set priorities between them. In practice there is usually a powerful authority who has to decide the priorities, which makes the promoted equity of stakeholder groups and values theoretically debased and impractical. Poullos (2010) argued the values-based approach tends to revolve around the principle of authenticity due to the tendency of focusing on the preservation of the fabric and tangible heritage elements, which underlies the concept of discontinuity. He therefore proposed a new approach—living heritage approach—highlighting the ‘continuity’ of the function, and of the process of maintenance and further arrangement of the (social and physical) space of a site. The approach is also advocated by ICCROM by carrying out the Living Heritage Sites programme and featured it a ‘people-centred’ approach (Wijesuriya, 2015). Another key concept of the living heritage approach is that, in the context of living heritage approach, physical and material structure may be given a low priority; changes in the fabric are an inseparable part of the process of continuity, and thus an essential requirement for the survival of living heritage. The theory provides flexibility and a different interpretation towards the principle of authenticity in heritage conservation. He emphasises on changes with the core concept of continuity, as follows:

changes in the function, the space, and the community’s presence, in response to the changing circumstances in society at local, national, and international level, are seen as an inseparable element of continuity and an essential requirement for the survival and continuation of a living heritage site over the course of time to present,... (Poullos & Sites, 2010).

The long-standing debate on the principle of authenticity and the appearance of the living heritage approach reveal that ‘change’ has become a critical debate; heritage practitioners have been discussing the matter of what can be changed and what should not be changed in conservation. The debate has yielded some important concepts in conservation theory and is certainly very important. However, prior to thinking about what change is allowed, by deriving from a specific type of cultural heritage (i.e. living heritage), should we not understand more

about change? For instance, the philosophy of change related to cultural heritage. Parallel to the way as conservation field explores what are the values of cultural heritage before thinking about what values should be protected. Therefore, this inspires me to explore at the beginning of the research the philosophy of change in ancient Chinese that has been accented and worshiped for thousands of years (Chapter 4), which is hoped to benefit this thesis with some different ideas for the discussion of change in heritage conservation.

Whilst the development and promotion of the living heritage approach by Poullos and ICCROM, UNESCO adopted the Convention for the Safeguarding of the Intangible Cultural Heritage (ICH) in 2003. The convention soon incorporated the concept of 'living heritage' into its framework (Wijesuriya, 2015). There are therefore many parallels between the ideals being promoted between ICH approach and the living heritage approach. It reveals that the aforementioned criticisms about the weakness of protecting intangible heritage in the values-based approach is acknowledged by ICH of UNESCO by incorporating living heritage approach. Community and its continuity as a core theme is the most apparent aspect of both the living heritage approach and ICH approach (Wijesuriya, 2015).

It was also during this time that viewing conservation as 'management of change' has become increasing popular, particularly at the era facing globalisation, urbanisation, and climate change. UNESCO hence developed and adopted *The Recommendation on the Historic Urban Landscape* (HUL approach) (UNESCO, 2011a), which also have some parallels to what has been developed in the living heritage approach, in particular with regard to community and social sphere. However, according to UNESCO, the recommendation has no intention to replace existing conservation approaches, i.e. the values-based approach; rather, it is an additional tool to integrate policies and practices of conservation of the built environment into the wider goals of urban development in terms of the inherited traditions and heritage values of different cultural contexts.

This Recommendation addresses the need to better integrate and frame urban heritage conservation strategies within the larger goals of overall sustainable development, in order to support public and private actions aimed at preserving and enhancing the quality of the human environment. It suggests a landscape approach for identifying, conserving and managing historic areas within their broader urban contexts, by considering the interrelationships of their physical forms, their spatial organization and connection, their natural features and settings, and their social, cultural and economic values. (UNESCO, 2011a)

From the above passage, the HUL approach have addressed many of the lately emphasised

important ideas and to reflect the current acknowledged trend of heritage conservation, which include acknowledging the significant role of a broader context and of the setting, the connection with natural features, and the significance of social and economic sphere. There are many parallels between the ‘landscape approach’ referred to by HUL approach and the matrix approach proposed in this thesis. However, what have been questioned and explored in the thesis, are the questions that is the ‘landscape approach’ clear enough either in the text of the recommendation and/or in the whole system/practice of UNESCO (including WH and related international charters), so that the practitioners or heritage authorities know how to follow?, and that is there any important concept or consideration missing in the approach, regarding the management of change? and that is this kind of descriptive and textual way of guiding as a management approach really effective, from the viewpoint of management tool? These questions are part of the main drive for the development of the matrix approach (Chapter 5).

From the review of the above three approaches that aims to enhance the performance of the conduction of the values-based approach, namely living heritage approach, Intangible Cultural Heritage (ICH) approach and the historic urban landscape (HUL) approach, there are some points in common that worth being discussed here. Firstly, community has been highlighted in the current heritage conservation, of which the diverse values had been acknowledged in the values-based theory initially. Secondly, intangible heritage has been emphasised its importance, instead of merely focusing on the fabric and tangible heritage. These two essentials result in the development of other emphasises, including the flexibility of authenticity principle, the change feature in values and community, the importance of the setting, and the importance of social sphere. However, the values-based theory does not oppose or constrain these two essentials, which can be tell from its two principal contentions; and there is no solid evidence showing the values-based approach is the direct cause of those issues alleged against it (e.g. the priority given by authority, preference of discontinuity). Therefore, the values-based theory has apparently evolved by integrating those newer ideas and values. With the evolution, new interpretation of the values-based theory with additional emphasises always appears, which reveals the reason why the values-based theory is still acknowledged and adopted as a preferred and underlying approach in global practice, in particular in UNESCO and WH system.

Whilst it is true that the ultimate goal of heritage conservation is to protect the values of heritage, applying the values-based theory as the only core idea to develop other theories and approaches for heritage conservation and management does not guarantee success and

satisfaction and has consequently caused many prominent issues. The current theory and approach for the management of change are such an example, namely minimal intervention theory and HIA approach. Notwithstanding the values-based approach attempts to give a full account of stakeholder groups and their values to be considered in the conservation and management process, the changing feature of identifying and assessing values inevitably implies a critical challenge. Demas (2002) addresses this challenge as follows: ‘Perhaps the greatest challenge is acknowledging that values are mutable and that there are few absolutes in terms of what is right or wrong’. This research hence questions, is it appropriate to use value that is itself mutable as the only aspect to assess changes? Shouldn’t there be any other aspect in the approach to supplement and redeem the inadequacy? The discussion leads to the proposal of a matrix approach with additional aspects (i.e. sustainability and resilience) for the management of change in this thesis.

Furthermore, from environment domain, there is a long-standing debate about whether ‘environmental values’ are intrinsic (Attfield & Belsey, 1994; Callicott, 1985; Minter, 2001; Naess, 1986; Pepper, 1996; Preston, 1998; Reser & Bentrupperbäumer, 2005), with different definitions from different backgrounds of scholars and experts in environment realm, such as environmental ethics, ecosystem service, environmental sociology and environmental psychology. The debate reveals there apparently exist different views with respect to values between social scientists and physical and natural scientists in environment domain. Reser and Bentrupperbaumer (2005) pointed out that there exists a serious problem and threat to effective protection, impact assessment, and management in Australia’s natural World Heritage sites with respect to the meanings, uses, and understandings of ‘World Heritage values’, and commented a more salient challenge with cultural heritage involved. This dissonance on values implies that an adequate adaption is needed particularly when using value aspect as the main criterion in managing change involving cultural heritage and nature, as the questions yielded in the last paragraph.

Back to the heritage domain, Avrami et al. have a comment from their observation with respect to conservation:

Conservation has come to be seen as “a complex and continual process that involves determinations about what constitutes heritage, how it is used, cared for, interpreted, and so on, by whom and for whom. It has also become evident that decisions about what to conserve and how to conserve are largely defined by cultural contexts, societal trends, political and economic forces—which themselves continue to change”. (Avrami et al., 2008)

The passage indicates two key points for conservation, one is making decisions, and the other is context. It is noteworthy that it is not necessary heritage experts who usually make decisions, rather, authorities, communities, interest groups, and even the public can also be involved in decision making. Therefore, an effective approach for managing change in environmental management is needed, that should not be a doctrinal text which usually can only understood by heritage practitioner, rather, a form which can guide the way decision makers think to achieve a more comprehensive consideration. It is the reason for the matrix form used to develop an approach in this thesis.

The other point, context, was observed by Avrami et al. its influence on the decisions (2008). Context has long been placed as a subsidiary role in heritage conservation, even can be observed in the three approaches, namely living heritage approach, ICH approach, and HUL approach that all view community the core theme. However, addressing the importance of community without paying equivalent attention on the context makes the promoted idea debased and impractical, which is like considering community as merely a physical entity. In the matrix approach proposed in Chapter 5, context is upgraded as a main role in management of change, which encompasses community, setting and social-economic sphere. The research seeks to explore whether it is necessary (Chapter 5 and 6) and to show how the necessity and advantages can be manifested through an investigation of an environmental management case with decision-making difficulties (Chapter 7).

2.2 Minimal Intervention Theory

Minimal intervention is undoubtedly one of the most important theories in heritage conservation, which is also one of the most relevant theories to management of change in heritage conservation and hence discussed in Chapter 5. The theory has developed another practicable tool, heritage impact assessment (HIA), which turns into a must-know nowadays when dealing with changes and/or interventions involving cultural heritage. Not only heritage professionals, but also practitioners and stakeholders of other fields, such as urban planning, architecture design, civil engineering and housing development, are increasingly facing the relevant tasks and issues of conducting HIA in recent decades, revealing its importance and demand in heritage conservation as well as environmental management in the modern world. HIA is hence one of the main themes of this research (Chapter 6).

Minimal intervention can trace its origins to Ruskin and Morris's 'Anti-Interventionist Movement' in 19th century Europe and was later widely adopted by both archaeologists and

heritage conservators. In general, the principle is understood as referring specifically to minimizing the use of new materials and maximum retention of original material when performing maintenance, repair, or stabilisation works, in order to retain the authenticity and integrity of heritage and protect its value under the values-based theory (Ureche-Trifu, 2013). The concept has been addressed in many international charters and documents, which mainly address how to apply the concept in conservation. However, this research does not intend to review them in this chapter, as the inadequacy of the theory existing in those charters are examined in Chapter 5 for developing a new theory. The current theory is best summed up by the maxim ‘do as much as necessary but as little as possible’ (ICOMOS, 1999)

Since the 1970s, some scholars and international conventions have presented the concept of minimal intervention with the degree of intervention in heritage conservation practice, which is mainly applied to built heritage (i.e. architecture, monument). In 1979, *The Burra Charter* was adopted, which defines the basic principles and procedures to be followed in the conservation of heritage places. The procedures include preservation, restoration, reconstruction, and adaption. Followed by Feilden’s (1982) identifying seven degrees of intervention: prevention of deterioration, preservation, consolidation, restoration, rehabilitation, reproduction, and reconstruction, and MacGilvray’s (Austin, Woodcock, Steward, & Forrester, 1988) four interventions including keep, change, destroy, and return, then the ICOMOS New Zealand in 1992 (ICOMOS, 1992), *Charter for the Conservation of Places of Cultural Heritage Value*, defines seven degrees of intervention: non-intervention, maintenance, stabilisation, repair, restoration, reconstruction, or adaptation, which has turned into the most widely recognised scale of the degree of intervention in global practice. Whilst the words of those degrees mentioned in the last paragraph are surely familiar to most of the practitioners, there is considerable variability in the meanings attributed to them, not to mention confusing people who are not of heritage background. Consequently, the degree of intervention has eventually become merely a descriptive function whilst the minimal intervention theory maintains its importance and status and further evolves with the values-based theory into practical approach in heritage planning and urban planning, namely HIA.

It is notable that minimal intervention is merely applied to physical heritage such as buildings and monuments, for safeguarding the principle of authenticity and integrity. Consequently, minimal intervention is criticised as material-based and being applied to only changes of tangible elements, not to mention intangible, social or other dimensions. Notwithstanding international practice seeks to include intangible dimension into the

application of minimal intervention in the later stage, by *the Xi'an Declaration* and the HIA approach of ICOMOS, suggesting applying HIA on heritage and its setting, the consideration in terms of intangible dimension is still rather limited, which reveals a salient gap between the development of heritage conservation and the development of minimal intervention, theoretically and practically. Furthermore, although the current intervention theory has attempted to take nature into consideration, it merely regards nature as landscape that revolves around aesthetic value. In other words, the main problem of minimal intervention is its exclusiveness that focuses on physical element of heritage, which overlooks communities, broader context, intangible elements and nature, all those mutable things, such that the consideration of intervention in managing change in environmental management can never be comprehensive. The aforementioned inadequacies have formed a gap, which has not been paid attention and therefore is worth further exploring as one of the core themes of this thesis.

This research does not seek to prove the principles of minimal intervention are incorrect, as in most of the cases, the principles work well with the physical elements. Rather, the research attempts to broaden and conceptualise intervention from the 'impact' side, to consider minimizing the overall impact and pursue harmony relationships between different dimensions and elements of heritage ensemble, as the target to be protected is no longer purely the fabric, and it should encompass all those mutable things as a whole, mentioned in the last paragraph. As stated by Ureche-Trifu:

a minimal intervention approach can be applied in protecting one of the site's values, or one of the stakeholder's interests, with dramatic effects on the other remaining values. In this context it is, perhaps, more important to consider minimizing the overall impact of any intervention, or conservation activity, on the site as a whole, with its network of values, then of applying a minimal intervention approach in conserving any one value. This will help ensure the long-term survival of the site, and more importantly of its meaning and significance.

Minimal intervention is a relative concept. Just as the Nara Document states that authenticity needs to take into consideration the site's broader cultural context, the same is true when discussing minimal intervention. (Ureche-Trifu, 2013)

It is therefore this study's intention to broaden the consideration and application of the current intervention theory, for better addressing contemporary and future demand in heritage conservation as well as environmental management.

2.3 Heritage Impact Assessment (HIA)

The minimal intervention theory that initially aimed for conserving monument and architectural heritage, in later stage has involved into the development of HIA practice that concerns both of internal and external factors affecting built heritage. Over the last century, practitioners worldwide have been performing movements to identify and express considerations about the impacts of changes, including human-made and nature-caused (e.g. disaster or aging), for protecting heritage values. HIA is currently applied by authorities, of international, national, and local level, before deciding whether or not to allow development and/or management proposals to implement if the plans submitted imply changes which put the value of heritage at risk (Pereira Roders & Van Oers, 2012). For instance, ‘*Council of Europe Framework Convention on the Value of Cultural Heritage for Society*’ (Europe, 2005), ‘*Conservation Principles, Policies and Guidance*’ (Heritage, 2008), and ‘*National Planning Policy Framework*’ (UK, 2012), set out statutory requirements for authorities of different levels to undertake HIA. Also in World Heritage system, in order to perform an effective impact assessment towards potential adverse changes from development and/or management plans for safeguarding the Outstanding Universal Value (hereinafter referred to as ‘OUV’) of cultural WH properties, ICOMOS provides ‘*Guidance on Heritage Impact Assessments for Cultural World Heritage Properties*’ (hereinafter referred to as ‘HIA of ICOMOS’) (ICOMOS, 2011), which establishes an framework of HIA approach and demonstrates how to undertake the assessment in WH circumstance.

The current HIA evolved from minimal intervention inherits all the problems aforementioned in the last section, but also because of influence from practice, such as statutory and administrative systems, as well as from many of the AHD issues in heritage conservation, presents even more complicated problems and obstacles (the authorised heritage discourse (AHD) is reviewed in Section 2.4.1). The fundamental problem with respect to management of change is that it includes the gap of minimal intervention, whilst the gap here is even more difficult to overcome due to the obstacles caused by some compound discourses. One discourse resides in the EIA system, and the other is the influence of AHD. So far, there exist some relevant research indicating issues in conducting HIA (Antonson, Gustafsson, & Angelstam, 2010; Bond et al., 2004; Lindblom, 2012; Masser, 2006; Teller & Bond, 2002), which all seem to point to the two discourses. However, there is still lack of systematic discussion on the issue of HIA, and it has not been pointed out that these two discourses are

the cause of fundamental obstacles. This study hence intends to analyse and manifest the existence and impact of these two discourses from two aspects—statutory system (including administrative system) and methodology, and to propose fundamental countermeasures and recommendations, so as to comprehensively tackle the issue of HIA.

The first discourse that obstructs the improvement of HIA is about EIA system and its influence, the review seeks to figure out the influence from the development context of EIA and other IAs related, as well as from the sectionalism of environment realm. The conduction of EIA originated from the adoption of the US National Environmental Policy Act (NEPA) legislation of 1969 (Congress, 1969). The Act stipulates that the scope of EIA covers the protection of ‘cultural resource’ by assessing adverse impacts, which shows the initial bond between EIA and heritage. Soon after the US NEPA, another critical legislation instrument also facilitated it into a global trend, which is *the Directive on Environmental Assessment* (85/337/EEC) of European Council (Council, 1985). It clearly requests a substantial conduction of HIA with EIA framework and requires Member States to integrate EIA into existing domestic statutory procedures. Consequently, statutorily conducting HIA in the framework of EIA has become a common norm amongst these European countries of which most countries are advance in heritage conservation (Teller & Bond, 2002).

Soon after the adoption of these two influential legislations, the inadequacy of consideration in social consequences was criticised, consequently both legislations successively established Social Impact Assessment (SIA) as a tool to supplement the neglected social dimension of EIA. However, SIA has seldom been implemented in the world, not to mention as a tool to deal with cultural heritage within EIA, as although SIA is mandated in conjunction with EIA, it is not mandatory to be implemented. It reveals that EIA and its embedded HIA have a tendency of overlooking and even avoiding from the consideration of social dimension. Followed by the development of Cultural Impact Assessment (CIA) and Heritage Impact Assessment (HIA), which are basically to supplement the insufficiency of EIA in terms of cultural heritage (ICOMOS, 2011). So far CIA has been conducted mainly for appraising impacts of development on indigenous communities (Partal & Dunphy, 2016), revealing the intention of using ‘culture’ as a scope to augment intangible sphere, as EIA that focuses on tangible and physical elements is inadequate to identify and protect the significance of indigenous heritage. Meanwhile, heritage practitioners narrowed the scope of culture to built heritage when initiating HIA, in order to engage and highlight some critical theories and principles of heritage conservation, as EIA apparently follows different philosophy. Regardless

of this goodwill, with the norm of integrating HIA into statutory and administrative system, including planning system and resignation system, plus the ineluctable bond with EIA, the whole system that based on EIA has showed quite a few shortcomings, including limited consideration of intangible aspect, little community involvement, deficiencies in methodological guidance, incompetency to identify potential impact, and lack of consideration of social dimension (Bond et al., 2004; Byrne et al., 2003; Jones & Slinn, 2008; King, 2000; Teller & Bond, 2002). From these issues, the author argues there exists a discourse that EIA dominates HIA with some associated systems, including legislative and planning system, as well as its sectionalism, which has led to a problematic conduction of HIA and an obstacle to the improvement of HIA. The discourse has imposed a disconnection between heritage and people, also importantly, it separates nature from culture/heritage as it misleads HIA that nature would be protected by environment part of EIA, whilst the environment part of EIA cannot really protect nature in terms of the heritage value of nature.

The second discourse reside in AHD. Notwithstanding there are already many countries conducting HIA with statutory system from international to local level, only the HIA of ICOMOS (2011) sets out a more specific and applicable framework, plus the influence from WH system, which turns into the leading approach for others to follow. The approach has consequently been applied as the framework of HIA approach of national and local authorities worldwide. However, as Patiwaël et al. (2018) argue that implicit assumptions in HIA of ICOMOS are still derived from the ‘preservation’ paradigm (the paradigm is reviewed in Section 2.4.3), which implies that the HIA of WH practice has been dominated by a discourse associated with AHD. However, since the current HIA approach of global practice is based on the minimal intervention theory and the values-based theory, the author of this thesis further argues that not only the HIA practice of WH system is affected by AHD as Patiwaël et al. argues, but the global practice of HIA is dominated by AHD, which obstructs the positive evolution of HIA. Moreover, since the engagement of the intervention theory and the values-based theory, the current HIA approach that takes value aspect as the only assessment criterion has caused unsatisfactory performance in terms of the extent of comprehensive assessment, it is expected that HIA methodology can be significantly improved by applying the matrix approach proposed in Chapter 5. Therefore, in summary, the author argues that the existence of these two discourses is the primary cause of obstacle to fundamentally improve HIA; and the issue cannot not be tackled without simultaneously fixing the statutory system and methodology, which are hence the two parts explored in Chapter 6.

2.4 Relevant Discourses and Paradigms

There is the edifice of cultural heritage management practice (made up of practice, guidance and legislation) which has been constructed around the pre-eminence of fabric, authenticity and expertise (referred to by Smith in 2006 as ‘the Authorized Heritage Discourse’). But there also exists an evolving approach that acknowledges difference, diversity, community and significance but accepts heritage as a practice that is constructed in the present. (Emerick, 2014)

Emerick’s passage reflects the phenomenon of the evolution of modern heritage conservation, notwithstanding it also implies there exists a notable dissonance in heritage conservation. The dissonance has presented the emergence of numerous binary classifications of heritage discourses and paradigms (Patiwael et al., 2018). These binary classifications distinguish the discourses (and paradigms) according to various characteristics, such as old vs. new, expert vs. community, protectionist vs. utilitarian, material-based vs. people centred, and top-down vs. bottom-up. Understanding important discourses and paradigms of heritage conservation is essential for anyone who wants to understand heritage conservation, as these discourses and paradigms show how and what the conservation theory and practice has evolved, and how far all those changes have achieved. Take the values-based theory for example, as aforementioned in Section 2.1, the theory has evolved with some additional concepts due to some debates, what the debates mean here are mostly resided in these discourses and paradigms. In other words, the values-based theory has evolved largely because of the benefits from the debates of these discourses and paradigms, regardless of its two primary principles unchanged. As to the theory and practice with respect to management of change, namely the intervention theory and HIA, the author argues they cannot catch up the evolution of heritage conservation due to some obstacles. The obstacles may be caused either by issues of the authorised heritage discourse (AHD) and/or relevant discourses that are reviewed in the following sections, or by some other issues or discourses, which is exactly a main part of the exploration of this thesis.

Discourse and paradigm have been used by many practitioners to elucidate the reflection on different conceptualizations of heritage and heritage management. The definition of discourse is described as ‘a system of statements made about aspects of our world which carry a set of assumptions, prejudices, and insights—all of which are historically based and limit the consideration of other alternatively valid statements’ (Allen, 2016). Regardless of similarity with discourse to some extent, paradigm can be defined as ‘a universally recognized scientific achievement that, for a time, provide model problems and solutions to a community of

practitioners' (Kuhn, 1963), which implies a paradigm determines ontological, epistemological and methodological perspectives (Denzin & Lincoln, 1994); it is a way of thinking and doing within a particular field of research or practice (Patiwael et al., 2018). Owing to the similarity and overlap between discourse and paradigm, some paradigms are considered as discourses in heritage conservation; for instance, the ternary paradigms referred to by Ashworth in Section 2.4.3.

The author considers the AHD, the sub-AHD referred to by Pendlebury, and the ternary paradigms referred to by Ashworth as AHD relevant discourses, which are reviewed respectively in the following sections. The AHD relevant discourses are acknowledged as general issues of heritage conservation, whilst they are particularly critical and influential with respect to HIA, as HIA involves theoretical, methodological, statutory, administrative and even political sphere.

2.4.1 Authorised Heritage Discourse (AHD)

Conservation as a noun is an activity that can be applied in many different contexts; and the term is applied in many different field of human action, such as ecology conservation, environment conservation and heritage conservation. The focus in this thesis is the harmonious conservation between cultural heritage and nature, which implies that the author seeks to explore the conflict and misunderstanding between these two fields, whilst we should not consider the discordance between these two fields as the only challenge and concern, as there also exist some prominent discordances towards the idea of heritage in heritage conservation realm itself, as it can be seen from Emerick's passage at the beginning of Section 2.4, of which the most influential one has been explicitly described as authorised heritage discourse (AHD hereinafter) by Laurjane Smith (2006). The AHD describes many critical issues and phenomenon of the current idea and practice of heritage conservation particularly under the dominance of the architectural conservation theory evolved in Europe in late 19th century.

The dominant perspective and theory of global practice have shaped the way practitioners and the public see and understand heritage—heritage has to be based on certain materiality of either historic or aesthetic interest, be it historic buildings or relics. This narrow view describes the main theme of the AHD, of which the characteristics as defined by Smith, as follows:

- 1) Assuming authority to define the 'legitimate spokespersons for the past', which tends to invite experts such as architects, archaeologists and art historians who are particularly

concerned with the material world, to judge if the past is valuable to protect. It is evidenced through monuments and tangible assets as opposed to other forms of expression, that people usually experience it passively, and that it derives from a universal aesthetics of taste and value largely determined by experts and authority rather than lay judgement. Smith argues that, within the AHD, the protection of heritage values falls to those experts with focus on material world to identify and protect the ‘authenticity’, value and meaning of this fragile material heritage. She criticises that the discourse underwrote the development of the World Heritage system, such that UNESCO and many of its practices came under continued criticism for its Eurocentric understanding of heritage. In the criticism, the World Heritage system and relevant UNESCO practices provide a forum within which nation states may assert their historical and cultural legitimacy and international worth, which is a process that inevitably favoured western Europe. The criticism was made not only from scholars and practitioners, but also from Indigenous communities and countries whose perception of heritage tended to be excluded by the AHD generally, and in particular the World Heritage system (Smith, 2015).

- 2) Regarding the idea of heritage as innately valuable—‘all that is good and important about the past’ is contributing to the development of the ‘cultural character of the present’. Within this framework heritage is something that is ‘found’, it has an innate value and inheritable value. The authenticity of which that will ‘speak’ to a common and shared sense of human identity, leading to a link to national identities (Smith, 2015). Smith argues heritage values are extrinsic from the user and the people experience it, and dynamic due to heritage is a cultural and social process. It means heritage should be deemed as a relational idea, which is about how individuals and communities actively take up positions in relation to nature, sites, buildings, activities, and memories.
- 3) The AHD appears as a lens to ‘see’ heritage and conservation. Conservation is deemed as the preservation of selected and credentialised buildings. It tends to exclude understandings of heritage that are not focused on fabric, that are not belongs to majority, and that are continuously changing, for instance indigenous heritage and water heritage, but on people’s identities, attachments, or sense of belonging.

2.4.2 Sub-AHD Referred to by Pendlebury

Pendlebury (2013) followed up on the idea of the AHD, by exploring the conservation-

planning practice in England. He unfolds the relationships that have developed between the policy spheres of conservation planning, regeneration and economic development. The finding reveals that conservation has largely successfully repositioned itself from being regarded as a barrier to development to being regarded as an active agent of change. In other words, the main course of the sub-AHD is the involvement of planning system that has tendency of development orientation. He argues that a distinct conservation-planning social entity has developed that the values and validated practice of conservation-planning are constructed as an AHD. The discourse and the issues it describes are considered relevant to and included in the thesis as HIA inevitably engages with planning system.

2.4.3 Ternary Paradigms Referred to by Ashworth

Ashworth (Ashworth, 2011; Ashworth, 2013; Ashworth, 1994) proposed a ternary classification regarding heritage paradigms. He observes that there exist three heritage paradigms that have emerged over time, namely ‘preservation’, ‘conservation’ and ‘heritage planning’ paradigm. He argued that varying understandings towards the nature of heritage values are the keys differentiating these co-existing paradigms. These varying understandings lead to the engagement with these paradigms that affect many spheres in practice, including the object of protection, the criteria of impact assessment, the selection of expertise or of actors, and the objective of conservation. Ashworth considers the paradigm shifts in the practice of heritage management had yet been incomplete, which means they continue to exist simultaneously. This implies that stakeholders engaged with one paradigm must confront and interact with stakeholders engaged with other paradigms, which leads to misunderstanding and miscommunication. Another feature is also critical, which is the inconsistency of shifting in disciplines. In other words, some disciplines have shifted to new paradigms whilst others have not. There are lots of examples in this regard, including the current idea of setting, as well as the current HIA approach that is developed from the values-based theory (both are discussed in later chapters). As to HIA, Patiwaël et al. (2018) argue that implicit assumptions in ICOMOS’s HIA Guidance (2011) still derive from the ‘preservation’ discourse, regardless of some shifts to the other two discourses being underlined in many of ICOMOS’s practices and charters, which reveals the fact that there exists a gap of development between HIA and general heritage conservation.

From Table 2-1, one can find many parallels between the ternary discourses and the AHD, which echoes what Smith argues that heritage is a process. The nature of heritage conservation

is a process of changing, as underlined by Ashworth, with core ideas shifting over time. From the review of Section 2.4, the AHD, the sub-AHD, and the ternary discourses of Ashworth all point to the same concern—authority, which can be a heritage authority of different level, such as government, World Heritage Convention and even ICOMOS (the advisory institution of WH convention), or a planning authority who is in charge of some heritage management tasks, such as conservation-planning and HIA. Authority also means system involved, no matter WH system, EIA system, urban planning system, and conservation-planning system, a statutory system inevitably exaggerates the systemic problems of heritage conservation. Therefore, the thesis hence uses these discourses to identify and describe the systemic problems with respect to management of change, and employs Critical Discourse Analysis (CDA) to assess the inadequacy of WH practice and international charters, and applies a comparative case study to analyse the statutory system of HIA (and EIA), which is expected to better address and explore current issues in this regard.

Table 2-1. Characteristics of the heritage management discourses. (Patiwael et al. (2018) based on Ashworth (2011; 1994)).

	Discourses		
	Preservation	Conservation	Heritage Planning
Focus	Object	Ensemble	Narrative(s)
Goal	Protection	Adaptive reuse	Use
Justification	Value	Value/Re-use	Utility
Criteria/values	Intrinsic	Preserve purposefully	Extrinsic
Authenticity of . . .	Object	Compromise	Experience
Change	Immutable	Adaptable	Flexible
Temporal nature of value	Static	Metastable	Dynamic
Actors (who has authority)	Experts	Policy makers/Planners	Users

Chapter 3 Methodology

As mentioned in Chapter 1, the thesis aims to bridge cultural heritage and nature in terms of environmental management, principally by proposing a novel way of thinking (i.e. the matrix approach) based on the core principle—harmony. It encompasses four parts of exploration, which starts from rediscovering the idea of cultural heritage of ancient Chinese (Chapter 4), to the discussion of the minimal intervention theory in modern heritage conservation (Chapter 5), the discussion of HIA (Chapter 6), then finally to the application of the matrix approach into practical management tool and environmental case (Chapter 7), so that the thesis can manifest the significance and applicability of the proposed matrix approach. To this end, the research contains both qualitative and quantitative analysis, the former covers all four parts (Chapter 4, 5, 6 and 7) for concept/approach development, whilst the latter is applied in Chapter 5 for verifying the representativeness of water heritage and in Chapter 7 to assist decision making in tackling a real environmental problem. Notwithstanding the methodology applied in each chapter is described at length in each chapter respectively, this chapter still summaries all the research methods applied for providing a comprehensive view in advance. Moreover, one special feature of the thesis regarding the methodology, is using water heritage as the representative type of cultural heritage throughout the thesis, as water heritage can best facilitate the functions of case study method to enhance the understanding towards the approach proposed and conceptualised in this thesis; the reasons will be further explained, and its representativeness will also be verified, in Chapter 4 and 5.

In the first part of the exploration (Chapter 4), it aims to rediscover the idea of cultural heritage of ancient Chinese, as well as the relationship with nature, as the foundation for developing the matrix approach in following chapters. As the idea of cultural heritage is attributed by the findings as the influence of the four schools of ancient thought, which contains considerable philosophical content, the chapter tends to apply research method that facilitates in-depth discussion in this regard. The chapter underlying this thesis hence follows case study methodology. Case study methodology generally contains six sources for information gathering, including interviews, archival records, documentation, direct observation, participant observation, and examined physical artefacts (Yin & Sage, 2009); this thesis employs all of them. As Merriam (2015) points out that case studies are useful in qualitative research that aims to bring understanding and meaning to a phenomenon or an abstract idea. Johansson (2007) indicates a common understanding is that ‘a case is a

phenomenon specific to time and space’ and ‘a case may change over time, as well as its boundaries’. According to Yin (2007), case study method is suitable for answering research questions that ask ‘how’ and ‘why’, where the researcher wants to discover or explain a phenomenon; the method is useful when context is important, but the boundaries between the case and the context are unclear. Yin also stresses that the case should focus on contemporary cases, whilst Johansson (2007) argues that within the research field of architecture and planning, where artefacts are often studied, the distinction between contemporary and historical studies is of less importance. Johansson further stresses that ‘the context of design and the context of use may be separated in time, but are often equally important to the understanding of the case of an artefact’. This chapter hence uses a water heritage (i.e. Huaqing Palace) as case study to investigate the influence of the four ancient thoughts from the fabric of heritage so as to rediscover the idea of cultural heritage of ancient Chinese. The data used consist of historical literature, site observation, archaeological reports, planning documents, and interviews with museum staffs. Meanwhile, with the assistance of interview with tourists/visitors of the study site, the common impression of linking the four ancient thoughts with the idea of cultural heritage also provides the inspiration and manifestation of this rediscovery.

In this thesis, case study method is not only suitable to Chapter 4, but also to the qualitative part of Chapter 5, 6 and 7. With bringing up the core idea of harmony between people, built environment and nature, as well as two essential aspects—sustainability and resilience—directly reflected by the harmony idea in Chapter 4, in order to response to the current issue of intervention theory in heritage management, Chapter 5 further applies water heritage case study (i.e. the Roman Baths, Dujiangyan Irrigation System and Yueya Spring) as the main method to develop the matrix perspective that involves time and space, as well as unclear boundaries between heritage, the surrounding context and nature. The data used consist of historical literature, site observation, news archives, authority’s management report, ordinance documents, and interviews with management authorities.

Prior to the development of the matrix perspective, in order to understand current issue of intervention theory in heritage management, mainly involving unclear boundaries regarding conservation target/scope, which is exactly one dimension highlighted by the proposed matrix, the chapter employs Critical Discourse Analysis (CDA) as the research method to investigate the current narrow view on the surrounding context to be conserved, namely setting, through the analysis towards textual data of World Heritage system and international charters. The

chapter examines the heritage management process through the framework offered by CDA (Fairclough, 2003, 2013; Fairclough, 2001), both in terms of theory and method of global practice. CDA offers us the vantage point from which we can test, analyse and comment upon the disharmony and dichotomy between cultural heritage and nature the narrow intervention view triggers for the practice of heritage. On the other hand, part of this chapter applies quantitative analysis, using World Heritage sites as the research object for verifying the aptitude of water heritage in developing the proposed matrix perspective.

As to Chapter 6, the chapter aims to discuss the issue of HIA and attempts to improve it fundamentally, which hence contains two parts—one is statutory system and the other is HIA methodology. The statutory system part also applies case study method, whilst the method is a comparative type that analyses and compares five representative countries, so as to provide a comprehensive view of the patterns of current global practice. The data used consist of legislative documents, authority's management report, ordinance documents, policy documents, technical reports, and planning records. The discovery of the patterns helps identify system problems, which manifests the author's argument that there exist multiple discourses that predominate the current HIA paradigm. The argument is also the key to fix the problem in terms of statutory system of HIA globally.

On the other hand, as for the methodology side of HIA, the chapter employs case study method with a water heritage case (i.e. Angkor WH site) that has diversely showed its adverse impacts from both internal factors (e.g. heritage conservation management) and external factors (e.g. planning policy, tourism development), to obtain a more comprehensive understanding towards possible adverse impacts through the proposed matrix perspective. The data used consist of news archives, conservation management report, planning reports, policy reports, ordinance documents, and WH documents. The case study helps yield comprehensive considerations in detailed level for practical management sake, which shows the benefits of superiority over the existing HIA methodology that merely focuses on the consideration in value aspect of physical sphere, meaning the ignorance of people and nature. The case study manifests the aptitude and applicability of the matrix perspective for being used in HIA as a framework of thinking.

As to Chapter 7, as the chapter aims to tackle a real environmental problem involving conflicts between cultural heritage and nature, the research draws on the underlying matrix perspective developed in Chapter 5 to yield a more comprehensive consideration in decision making process. In order to show the applicability and aptitude of the matrix perspective in

integrating with management technique/tool of other fields, the research demonstrates a transformative application of the matrix into value tree of multiple criteria decision analysis (MCDA) method, which shows advantages in selecting appropriate and competent criteria for achieving harmony between conflicting roles (i.e. heritage conservation, nature protection, economy development) and stakeholders. The matrix perspective also facilitates community inclusion and public engagement, as the MCDA involves a questionnaire survey method of stated preference method to elicit the preferences in monetary valuation from the public and the consumers, which makes the MCDA feature participatory. The data used in the case study (i.e. Daxi dogan pollution) consists of questionnaire survey, water quality data, waterway discharge data, construction cost investigations, togan cost investigations, policy documents, authority's management reports, and stakeholders meeting minutes. The proposed participatory MCDA, with the advantages of the underlying matrix perspective, presents an integrated methodology that simultaneously considers heritage, people and nature and concerns past, present and future, which is where harmony is supposed to reside in.

Chapter 4 Rediscovering the Idea of Cultural Heritage and the Relationship with Nature—Four Schools of Essential Thought of Ancient Chinese

4.1 Introduction

In recent developments, heritage conservation has been considered and highlighted as a process of management of change (Ureche-Trifu, 2013); furthermore, from the literature review chapter one can see the value of cultural heritage has no longer been deemed to be immutable (Ashworth, 2013; Byrne et al., 2003; Poulios & Sites, 2010; Smith, 2006). Given that this study seeks to make an in-depth discussion with respect to management of change, yet the current debate centres on the matter of what is allowed to change and what is not in conservation (Poulios & Sites, 2010; Ureche-Trifu, 2013), therefore, understanding the relationship between change and cultural heritage prior to the current debate is essential. Ancient Chinese culture has always been emphasised on the philosophy of change (Čarnogurská, 1998; Li, 2008; Schwartz, 2009; Sector, 1998), which inspires the author to research as part of the thesis. This part of the exploration can help understand the views of ancient Chinese on change, as well as the relationship with cultural heritage, which can promote the practice of regional pluralism in heritage conservation. On the other hand, it is expected to provide new insights and useful ideas as the core of the thesis, for the development of methodology in other parts.

The dichotomy between heritage, people and nature in heritage conservation has long been criticised. With the tendency of focus on the fabric at the beginning stage of modern heritage conservation, it has led to overlooking the significance of people aspect (Smith, 2015; Waterton & Smith, 2010). Notwithstanding the later development highlights the engagement of community, it has yet to pay much attention to something behind the community (Byrne et al., 2003; Waterton & Smith, 2010), namely context. On the other hand, the division between nature and culture is a sustained issue and concern in heritage conservation (Brockwell, O'Connor, & Byrne, 2013; Taylor & Lennon, 2011). In recent years, due to the emergence of non-Western conservation perspectives, as well as the advocacy of pluralism in conservation, the connections between nature, heritage and people have gradually been regained (Brockwell et al., 2013; Winter, 2014; Zhang & Wu, 2014). As such, the process of the development of

modern heritage conservation can be understood as starting from heritage, then with the inclusion of people, and eventually to the inclusion of nature, for achieving comprehensiveness and harmony in conservation and understanding. However, for achieving this goal, the process is not necessary and universal for many, as there exist many regional cultures known for the feature that places nature as the core in their cultures, as was the case in ancient China (Chen & Wu, 2009; Liu, Yeh, Chick, & Zinn, 2008; Yun, 2013), as well as in indigenous communities (Byrne et al., 2003; King & Kendall-Miller, 2016; Smith, 2015). In the modern movement of heritage conservation, modern China is eager to catch up the step that is dominated by Western European countries with the process of development as such, whilst somehow Chinese forget what they have inherited from the past—the core idea and values of harmony between nature, people and culture, which might have been misplaced in the understanding of cultural heritage and heritage conservation. Therefore, through rediscovering the idea of cultural heritage and the relationship with nature in ancient China, this chapter seeks to regain the wisdom and provide a more advanced understanding of the past with respect to cultural heritage, which additionally echoes the principle of cultural pluralism in conservation.

In addition, when we compare the ternary discourses observed by Ashworth (reviewed in Section 2.4.3) with the attributes from the idea of cultural heritage of ancient China, it is interesting to note that many of the ideas and values regarding Chinese cultural heritage that are based on the core theme of change and harmony, are parallel to the latest developed discourse of Ashworth shaped by the West. This is puzzling, as people expect that more understanding of regional culture should reflect more distinction, in particular between the East and West. So, does this coincidence mean anything? The additional finding might yield inspirations to further exploration in philosophy sphere of heritage studies in the future.

Therefore, this chapter argues that Chinese cultural heritage features not only abundant nature elements, but also considering change and harmony as a core concept, which provides some ideas that can benefit the development of managing change in heritage conservation. It is therefore of merit to rediscover what is the ideology behind the fabric. Through field investigation, including archival, documentary review and physical survey, plus interviews with visitors, this study attempts to find the ideology behind the material presentation of Chinese cultural heritage, by the case study of Huaqing Palace of Tang from (723 to 755 CE). The historical formation of the palace and the way of using natural resources, the hot spring, offer a window to see how the bathing culture and its physical infrastructure was endowed with the four schools of Chinese thoughts, namely, Buddhism, Taoism, Confucianism, and *I*

Ching with respect to the views towards nature, body and spirit. The chapter then provides a critical review on the four schools of thoughts by showing how the ideology and values had forged the nature of Chinese cultural heritage and explores how the four thoughts had shaped the idea of cultural heritage and heritage conservation in ancient China. The findings regarding the core theme—harmony in change—are expected to underlie the development of the methodology in the later parts of research.

4.2 Debates of the Current Global Heritage Conservation

4.2.1 Divisions between Fabric, People and Nature

The theory and practice of modern heritage conservation movement was originated in Europe in the 19th century. Due to a large number of monuments and historical buildings damaged by wars, the repair and restoration demands prompted the rise of heritage conservation. Under the context that monuments and historical architectures were the primary targets to be conserved at the early stage of the development of heritage conservation, heritage conservation not only developed into an independent domain of knowledge, but also with main concern on the physical part of heritage (Jokilehto, 2007). The understanding of cultural heritage value consequently had the tendency to historical, artistic and scientific values that could more readily reflect on the fabric. Plus the influence from international practice, i.e. World Heritage Convention and charters, the issue of reification (i.e. focusing on the fabric), along with the related issue of division between people (i.e. living community), nature, and the fabric have been criticised in the recent decades (Brockwell et al., 2013; Smith, 2006). As Taylor and Lennon noted:

Inherent in the pre-1990s global view of heritage was some division, and hence tension, between cultural and natural heritage conservation. Cultural heritage residing mainly in great monuments and sites was divorced from scientific ideas of nature and wilderness as something separate from people, an ideal seen in the extreme wilderness ethic. (Taylor & Lennon, 2011)

The division between culture and nature did not incur much debate at the earlier stage of the development. However, in the recent decades, it has led to perpetual disputes, particularly from Asia Pacific, where there are abundant indigenous cultural heritage, such as Australia (Pollock-Ellwand, Miyamoto, Kano, & Yokohari, 2009; Smith, 2006; Taylor, 2004, 2009; Taylor & Altenburg, 2006; Winter, 2014). In global heritage conservation, one can often see that real

cases involving indigenous heritage do reveal special views on nature and the universe, whilst their special values were once regarded as ‘endemic example’ and hardly had further exploration in understanding (Taylor, 2009), as such indigenous heritage were usually excluded from global practice, namely World Heritage system, as was described by Smith (2006) as part of AHD.

Since the debate, World heritage system has devoted to mitigating the issue of division between nature and culture, it can be seen from two notable evolutions in the convention, as well as some advents of international charter, such as the Nara Document (1994), which highlights spiritual and philosophical values from living community and nature. As to the two important changes of WH convention, one is that significant interactions between people and the natural environment have been recognized as ‘cultural landscapes’ since 1992; the other is that the separated selection criteria of cultural WH and natural WH were combined into one set of ten criteria to promote the inscription of the mixed property since 2005. However, the performance is still rather unsatisfactory (Taylor & Lennon, 2011). Taylor and Lennon investigated the improvement in this regard in World Heritage practice and noted some critical problems. They argued that although the merger of cultural–natural criteria in World Heritage system has resulted in more Cultural Landscape and mixed site inscriptions of those assessed to have outstanding universal values, but ‘there is still poor on-the-ground understanding of management of all the integrated values expressed in the landscape’. They also pointed out the inability to form multidisciplinary teams of state authority (including local authority) for the task of integrating management of all values in the landscape, as well as the intentional or unintentional ignorance towards cultural and spiritual values for local communities. Plus, the separate administrations of the two advisory bodies—ICOMOS and IUCN—further compound the dichotomy, which ‘select experts for site assessment of nominations based on their specific discipline and then forwarding separate reports with their own disciplinary bias’. The notes of Taylor and Lennon reveal the dichotomy issue not only exists in WH system, but also has become a general issue of global practice.

Through the prominent indigenous heritage cases all over the world, practitioners gradually recognise that it is of merit to put more effort on exploring the relationship between culture and nature, and that there is no way to achieve comprehensive protection in heritage value without adequate understanding towards nature aspect. However, the ancient Chinese culture also features peculiar views on nature and the universe; the significance of this sphere of ancient Chinese culture is by no means less than the significance to indigenous culture. This

is puzzling, as little literature underlines this character in heritage conservation. The problem is more than the character being ignored, rather, it reflects a knowledge gap that modern Chinese may lack of understanding in how the peculiar views on nature and universe significantly affect the formation and the idea of cultural heritage.

The WH convention in the recent past acknowledged two points from the experience of improvement:

At the conceptual level, there is a growing need to rethink natural and cultural heritage as an interrelated and interdependent concept, rather than as separate domains. At the management level, there is a need to rethink current approaches, where nature and culture management remain separate. (Convention, 2015)

The passage reflects exactly what this thesis seeks to achieve. To rethink natural and cultural heritage as an interrelated and interdependent concept, this chapter that rediscovers the harmony idea in ancient Chinese is regarded as the foundation. The latter chapters keep exploring it by using water heritage as a presentation and develop new management approaches highlighting the inclusion of nature, heritage and context.

4.2.2 Universalization vs. Pluralism

In addition to the debate over the dichotomy of culture and nature, the current global practice has also incurred other issues, such as the excessive emphasis on the ‘authenticity’, neglecting intangible element, bias in favour of aesthetic value, preference for authority’s or elites’ values, and overlooking community’s rights and engagement. Most of these issues are described as AHD by Smith; it is noticeable that these issues are interrelated, and that the causes of these issues reflect an inextricable connection with material world (Smith, 2006). More importantly, there exists a tendency of universalization in the current global heritage conservation, which makes these issues or AHD even more ubiquitous worldwide.

The universalization in conservation theory has shown some inapplicability in some regions, particularly in Asia Pacific. The ‘difference discourse’ that underlines regional pluralism in conservation theory has been widely discussed in the past two decades. There are a number of examples in East and South Asia addressing the issue of authenticity, which is mostly attributed to architecture types that mainly apply timber structures. The architectures feature having traditions of maintenance by replacing damaged timber or restoration procedure (D'Ayala & Wang, 2006; Winter, 2014). In the modern heritage conservation movement of China, despite the fact that the universalization has caused many disputes, such as the Qufu

Declaration expressing the disagreement with certain conservation methods from international charters and concepts (Zhu, 2012), it still dominates and drives the practice towards the direction of AHD (Wu, 2014; Zhang, 2018; Zhang & Wu, 2014; Zhiqin, 2015). Notwithstanding China has been catching on with the listing of forty World Cultural Heritages (till 2017), second only to Italy, as well as the achievement of establishing new charters, including China Principles, Shanghai Charter and Xi'an Declaration, many scholars and practitioners still dispute that these charters are not proposed with peculiar perspectives to comfort to Chinese context, as the three charters still focus on the 'curative' measures of physical heritage and there seems something significant and peculiar still missing. There is even suspicion of reinforcement to Athens and Venice Charter in order to ingratiate international organisations (Qian, 2007; Zhu, 2015).

A number of experts have suggested that the cultural heritage in Asian is often more closely related to philosophical and religious thoughts, and it is hence necessary to put forward regional theory or perspective of conservation in accordance with local thoughts and social context (Kwanda, 2009). Taylor and Lennon (2011) also noted that 'central to discussions on heritage conservation in Asia ought to be recognition of the intangible value systems that traditional communities associate deeply with so-called natural areas as part of their cultural beliefs' and 'human rights of Indigenous and local communities whose systems of looking at land and landscape will differ from western ideas embodied in World Heritage practice'. A recent follow-up discussion was made by Akagawa (2016) regarding Ise Shrine that has become an iconic representative of an 'Eastern approach' to heritage proposed from the discussion of the Nara Conference, who argues that its presentation and interpretation as a cultural site devoid of its distinct religious and political significance, limiting what can be learned from it. He argues that without full recognition of the religious beliefs intimately embedded in the traditional social context, practices and attitudes related to built heritage, recognition of cultural diversity would remain limited and the declaration in Nara Document (ICOMOS, 1994) may be misconceived as merely a concession towards the standard of authenticity, as such a criticism towards the three Chinese international documents. Similarly, in Chinese case, the author hence argues that without understanding and acknowledging the significance of ancient Chinese's peculiar view on nature and the universe related to philosophical and religious thoughts behind fabric, it is not likely to comprehensively protect and interpret heritage value, not to mention to sustain pluralism in heritage conservation.

4.3 Case Examined—Huaqing Palace of Tang

In order to understand the presentation and influence of the peculiar cultural characteristics originated from the four thoughts on Chinese cultural heritage, but also to explore the perspectives and attitudes of ancient Chinese towards heritage conservation, a case study is hence carried out to help find the peculiar views of ancient Chinese towards nature and heritage in this chapter. There are several reasons for selecting Huaqing Palace of Tang for the case studies instead of a traditional architecture. Firstly, Huaqing Palace covers the features of not only traditional architecture, but also its connection to nature through hot springs, as well as a miniature role of the capital, which can better present peculiar cultural characteristics reflecting on more aspects of heritage, tangible and intangible sphere. Secondly, the site has experienced numerous changes in a very long period covering many dynasties and times, which makes it an adequate role to deduce some common views of the ancestors towards heritage conservation. Thirdly, it is a very important heritage in Chinese history, also one of the most well-known historic stories in Chinese culture. Notwithstanding physical heritage had been abandoned and covered after Tang dynasty for more than a thousand years, the heritage had still been living in Chinese's mind for generations before the very late archaeological discovery in 20th century. How could a historic story endlessly yield literature and art works that also became heritage in the later times, which perpetuates the story and Huaqing Palace? Does it reveal something special and distinct, in terms of the idea of how heritage is constituted and how heritage is passed on and interpreted?

4.3.1 Development History

Mt. Li, the Chinese emperors' favourite nature with excellent *Feng Shui* conditions, is located in the east suburb of Xi'an where used to be the capital Chang'an of thirteen dynasties (around 1200 years) of ancient China (Figure 4-1). The mountain features not only beautiful scenery regarded as the royal garden of the imperial palace of the capital, but also the prestigious hot spring that has been considered by Chinese as the 'best hot spring in the world'.



Figure 4-1. Location of Huaqing Palace. Source: Based on Wikimedia ‘Xian’.

The Mt. Li hot spring has been actively utilised since the Jiangzhai ancestors of Mt. Li area, dating back some 6,000 years to the Yangshao period (New Stone Age). With the spectacular scenery of Mt. Li, the outstanding health value of the curative hot spring, and the adjacent location to the capital, King You of Zhou (795 to 771 BCE) formally established the imperial exclusiveness of Mt. Li hot spring by building Stars Thermae as an imperial retreat at the place of the emergence of the hot springs, which is at the northwest foot of the mountain. Followed by Emperor Qin Shi Huang of Qin (259 to 210 BCE), Emperor Wu of Han (141 to 87 BCE), Emperor Wu of Northern Zhou (560 to 578 CE), and Emperor Wen of Sui (581 to 604 CE), they respectively undertook significant restoration to the retreat. As the first ruler uniting ancient China in 221 BCE, Emperor Qin Shi Huang adored Mt. Li hot spring for the enjoyment of his life time, and selected the north foot of the mountain where he built the mausoleum for his afterlife,¹ which reflects the bond and attraction of the Mt. Li hot spring environment to the ancient Chinese royalty where has been regarded as a propitious and sacred place for people to communicate with the universe and gods. Subsequently, two emperors during the Tang Dynasty undertook the most significant reconstruction on the site. In 644 CE, Emperor Taizong of Tang considerably reconstructed the retreat into a discrete palace and named it Palace of Warm Thermae. Followed by Emperor Xuanzong of Tang in 723 CE, with the hot

1. The Mausoleum of Qin Shi Huang, Eighth Wonder of the World, World Heritage.

spring source as the pivot, he massively and extravagantly expanded the palace area into a miniature of the capital as his second/substitute palace and named it Huaqing Palace, a title that has been retained until the present day. Since the palace was specially built with hot spring baths, it was also called Huaqing Baths or Huaqing Pool (Xu, 2008).

Huaqing Palace of Tang (Figure 4-2) covered an area north from Weihe River, south to Mt. Li, for 1.7 km, with the terrain rising from north to south, and was enclosed on the east and west by Linshui River and Tongshui River, for 1.2 km. The whole palace area was an enclosed land encompassing three zones that were, from north to south, Zhao Ying County, the main palace, and Ban Court of Mt. Li. Zhao Ying County was arranged as a miniature of the cityscape of the capital Chang'an, mainly for the residence of the government officials and royalty; the main palace functioned as the palace of the capital; and Ban Court of Mt. Li was a huge royal garden with numerous religious and entertainment facilities.

According to the records, from 712 to 755 CE of his reign, almost every winter, the emperor relocated to Huaqing Palace with his consort Yang (one of the four historic beauties of ancient Chinese). The emperor and Yang enjoyed the pleasures of thermal bathing and a variety of entertainment there, before returning to the capital Chang'an in the late spring of the following year. It was in his period that Huaqing Palace reached its historic height of power and splendours (Xu, 2008).

Whilst Emperor Xuanzong was busy seeking romantic pleasures and ignoring the government affairs, as a result, the powerful Tang Empire began to fall. Huaqing Palace was extensively destroyed in the subsequent rebellion war,² and was abandoned and lay ruined throughout the Song, Yuan, Ming and Qing dynasties for around a thousand years. Notwithstanding the ruins had been buried underground and disappeared for centuries, the existence of Huaqing Palace and its well-known stories have always been kept in people's minds (i.e. the extreme enjoyment with the most beautiful lady leading to the fall of the Tang regime). Since 1949, and the advent of a new non-monarchy era—the People's Republic of China, sections of the Huaqing Palace have been reconstructed as a memento above the ruins covered, in accordance with the historical documents of Tang, and expanded several times to the present scale albeit still less than one tenth of the genuine palace of Tang. Since then, the

2. The An Lushan Rebellion was a devastating rebellion against the Tang regime, which caused emperor Xuanzong to flee to a sanctuary of Sichuan, in the meantime he was forced to order the strangling of consort Yang, due to the blame from emperor's bodyguard troops on her family for exposing the whole country to danger.

reconstructed palace has become a popular tourist spot, listed as a 5A scenic area by Chinese government. In 1982 during a tourism construction project in the reconstructed palace, the famed and mysterious ruins of Tang were unexpectedly discovered, recognised as the most important archaeology discovery of Tang. Soon after, the site is designated as a ‘Major Historical and Cultural Site Protected at the National Level’ by Chinese government.

4.3.2 Presentations of the Four Thoughts on the Fabric

In 1982 during a tourism improvement construction project in the reconstructed Huaqing Palace, the famed heritage of Tang was unexpectedly discovered. Afterwards, several archaeological excavations were sequentially carried out, of which the outcome of the whole task is considered as the most significant discovery of Tang dynasty to date. The discovery finally manifests the existence of the great Huaqing Palace of Tang. Through the re-examination of the cultural characteristics of the archaeological findings, this section attempts to unfold the peculiar view towards nature behind the physical sphere of the heritage.

The first excavation uncovered Stars Thermae of Tang and the previous cultural layers of Qin and Han (Luo & Liao, 1990). Stars Thermae was the hot spring bath used by Emperor Xuanzon’s ancestors, including Emperor Taizong of Tang, Gaozong of Tang, and many other former emperors of Tang. After Emperor Xuanzong of Tang built his Lotus Thermae, Stars Thermae was no longer used by emperor but was used as a reservoir to supply the other baths. The new role of Stars Thermae implies the monarch’s love and generosity in sharing the godsend gift with his people. It also reveals that the purpose of showing respect to the heritage pool that features divine communication between the ancestors and gods through the godsend hot springs constitutes the idea of heritage conservation.

The 1983-1986 excavations basically confirmed five thermaes of Tang encompassing Lotus Thermae, Begonia Thermae (for consort Yang), Prince Thermae, Shangshi Thermae (for close officials), and Yichun Thermae (for maids in the palace), as well as two unspecified thermaes built before Tang Dynasty (Luo, 1991). Then the 1988-1990 excavations confirmed the existence of the Mt. Li Thermae of Qin and Han beneath Tang layer (Luo, 1996). The 1995 excavation continued to explore Pear Orchard and its Small Thermae of Tang where Emperor Xuanzong and Yang trained talented opera and musical performers (Luo, 1999), which plays an important role in the development of Chinese opera culture.

This research re-examines the archaeological findings of Huaqing Palace of Tang, through a different lens that focuses on nature elements of the fabric to unfold the view of the four

schools of thought towards nature. The data obtained and analysed by the author through site observation and review of archaeological reports (Luo, 1991, 1996, 1998, 1999; Luo & Liao, 1990) is summarised as follows (see Appendix A for the analysed data),

- I. The overall layout of the Tang Huaqing Palace, including the three main areas, did explicitly follow the framework of the capital Chang'an. It illustrates the Confucian thinking of the 'happy/golden mean' through the principle of central axis and symmetry, implying the balance and fairness in personality and behaviour facilitate harmony in society (Wu, 2013). On the other hand, the layout of the whole palace area enclosed by the three rivers and Mt. Li demonstrates a typical *Feng Shui* principle of site selection that is believed to bring harmony and prosperity to people and environment (Figure 4-2) (Marafa, 2003).

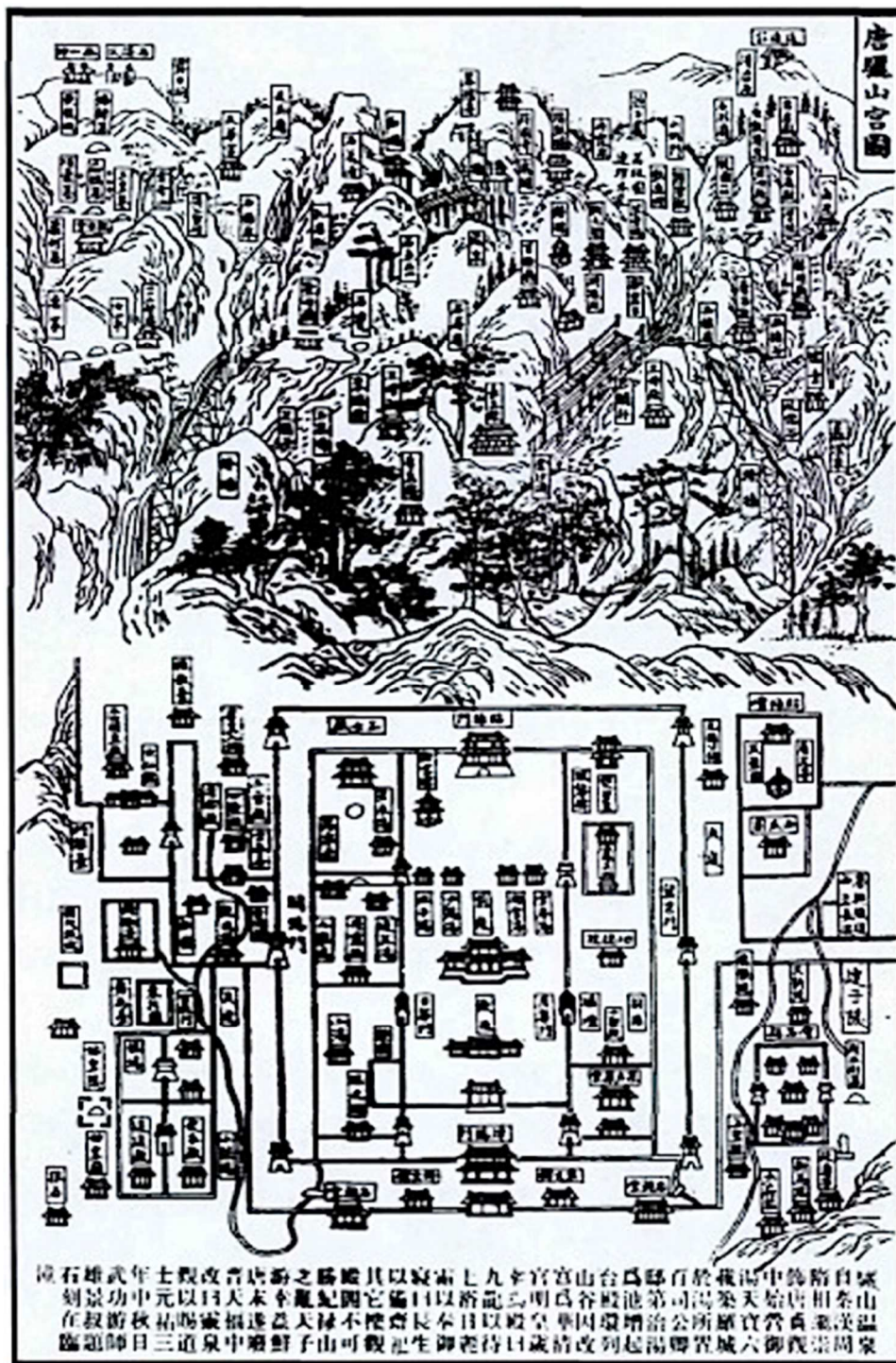


Figure 4-2. The map of Mt. Li palace of Tang made by You Shixiong of Song. Source: Li (2011). Legend: upper part (South) shows Ban Court of Mt. Li, lower part (North) shows the main palace that follows the principle of symmetry, based on the thought of Confucianism. Zhao Ying County (further North) does not show in the map. The whole three areas are surrounded by Mt. Li and two rivers, reflecting great *feng shui* principle for site selection of palace.

- II. Notwithstanding the arrangement of the bath buildings does not seem to strictly follow *Feng Shui* in terms of the principle of layout of architecture complex, it demonstrates the rooted sense of Confucian in terms of hierarchy. By locating the thermae of user with higher status closer to the hot spring source to show their priority to enjoy the hot springs, the respect between different roles and statuses facilitates harmonious relationships. For example, Stars Thermae (for passed emperors) supplied water to Prince Thermae, Shangshi Thermae (for use of close officials), and Yichun Thermae (for use of maids), whilst Lotus Thermae (for Emperor Xuanzong) supplied water to Begonia Thermae (for consort Yang).
- III. The idea of ‘learning from nature’ of Taoism apparently reflects on everywhere of the pools of the Tang, including the materials, engineering methods, and appearance decorations. The wall and floor of the bath pools were constructed and cemented with multi-layered method and nature-based materials for waterproofing. Instead of applying metal (i.e. lead sheets) to waterproof as the Romans often did (Hiers & Rose, 1935), the baths of Tang in the site were consistently constructed with masonry as the surface layer, and with cord-patterned brick and rammed earth as the waterproofing layer, which are all related to earth. The use of pottery pipes between pools is another example showing the prevention of metal; as ancient Chinese considered metal as an unnatural material such that hardly apply in the structure of resident architecture, not even with a metal nail and a bracing (Shiping, 1991). Moreover, the sophisticated inlet and outlet of the baths also reveals the intention of highlighting naturalness. Instead of using an open channel inlet by overflow, the inlet of Tang baths was particularly set at the bottom of the pool with the connection of male-female pottery pipes, designed as a hydraulic pressure tube set underground, so that hot springs gushed from the bottom. Also, the design of the outlet and the water level control of the Tang pools also elegantly follow the principle of naturalness. Instead of using an open channel outlet by overflow, the designer set the drain hole at the bottom, and connected it by an underground pipe to an open channel. This open channel, with a moveable weir plate, was used as the communicating vessel for controlling the water level. This special and ingenious inlet and outlet system not only created a good thermal convection that enhanced the temperature uniformity and comfort, but also produced a nature-like gush of hot spring water from the bottom, which created a similar condition to a natural hot

spring pond and reconstructed the sense of naturalness and preciousness (Figure 4-3). Furthermore, the appearance design also highlights naturalness by shaping and naming the pools after plants, as well as employing *Bagua*³ characters (Figure 4-4).

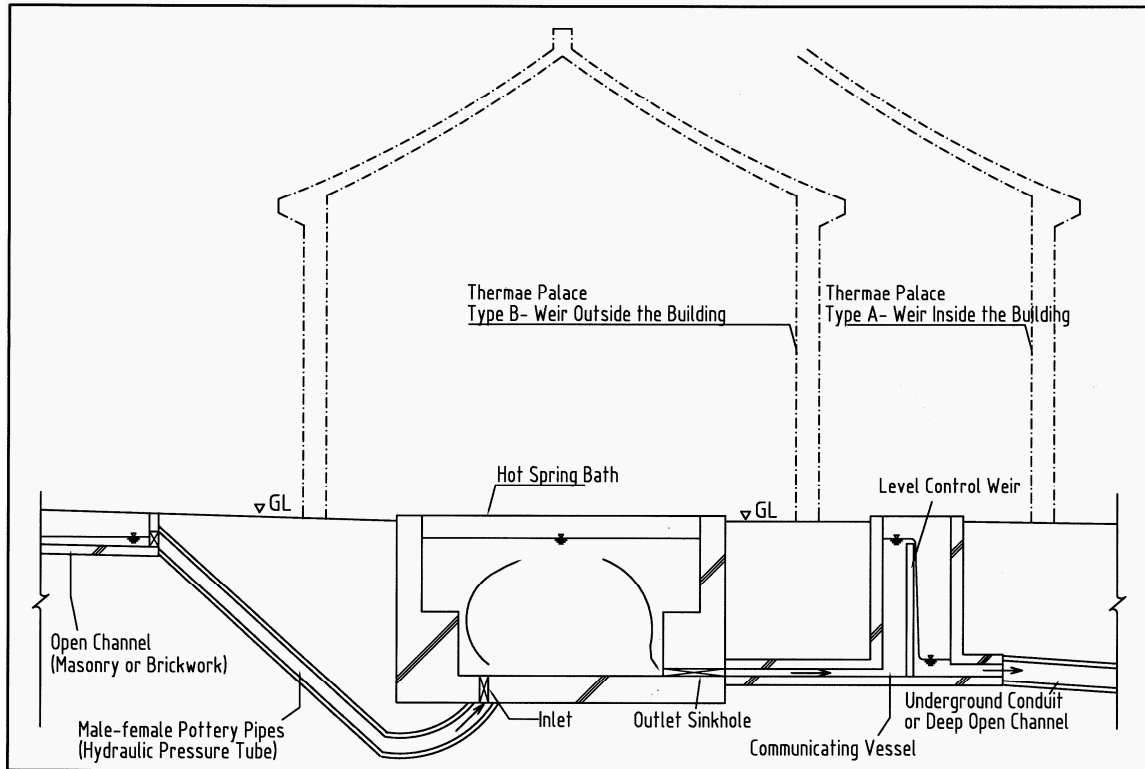


Figure 4-3. The inlet and outlet of the baths. Source: Author.

3. *Bagua* are eight trigrams, and the fundamental principles of *I Ching*, also used in Taoist, to represent the movement of all natural phenomena. *Bagua* is also related to *Tai Chi* philosophy and the Five Elements, and applied in *Feng Shui*, cosmology and Astronomy.



Figure 4-4. Lotus Thermae (for the emperor). Legend: The lower part of pool wall was made into a shape of octagon, which represents *Bugua* implying conducting harmony of all aspects of the world. The upper part of pool wall was made into a shape of lotus that is regarded as a sacred object in Buddhism, symbolising the purification and freedom of soul. Legend: The photo demonstrates the special and exquisite outlet system, which employs Type A of Figure 4-3. Source: Author.



Figure 4-5. Begonia Thermae. Legend: The photo demonstrates the special and exquisite outlet system, which employs Type B of Figure 4-3. Source: Author.

4.3.3 Intangible Heritages Involved

It is worth to make discussion on the associated cultures of Huaqing Baths because they can also help understand how the four schools of thought shape Chinese cultural heritage. The significant cultures behind Huaqing Palace feature a combination of the bathing culture and the hot springs culture of ancient Chinese. The bathing culture can be generalised into three aspects in terms of demand, including the health needs of daily life, the demands of social etiquette, and the influence of religion, whilst the hot springs culture reveals how ancient Chinese viewed nature.

In terms of daily life, bathing had developed into a custom of good habits and manners since the Qin Dynasty (221 to 206 BCE)—washing the head every three days and washing the body every five days, ruled in *Liji* (or the Book of Rites) and *Yili* (or the Book of Etiquette and Ceremonial) that are included as the Five Classics of Confucianism. In the Han Dynasty (206 to 220 CE), the law of ‘*Xiu Mu*’ was established,⁴ which gave an official day-off every five days to officials to take a bath and change clothes (Schafer, 1956). Afterwards, the Chinese continued to regard bathing as an important thing in daily life. As recorded in *Qing-su ji-wen*, it was believed that bathing on ‘good days’ would bring good fortune, so that people in the Ming and Qing period (1368 to 1912 CE) bathed on the basis of those good days and times listed on the traditional Chinese calendar (Kang, 2005). It is recognised that the selection approach of auspicious time and day listed on the calendar was developed with the principles of *I Ching* (Lin, 2007).

As to social etiquette, ‘Confucians take a bath to purify moral’ and ‘Confucius went to court after bathing’ in *Liji* manifest that how Confucius had been practicing what he preached about the bathing ritual. Since then, people who were going to participate in important activities, such as joining in celebrations or formal social occasions, receiving guests, etc., usually bathed beforehand as a spiritual self-purification and respectful manner.

As to the influence of religion, Taoism and Buddhism both believe water is cleansing and plays a vital role in expelling evils and providing spiritual purification, particularly in practicing their rites. Buddhism, in particular, has always advocated the importance of bathing, forming a monk's habit and rule of frequent bathing. Consequently, there were usually bath facilities in both Taoist and Buddhist temples during the Tang period when the religious activities were frequent and prosperous (You, 2010).

4. Lit. ‘a break for bathing’.

The idea of body privacy in bathing had also changed due to the influence of Taoism and Buddhism; notwithstanding the Chinese religions usually represent constraint. In the earlier ancient Chinese ritual society, the Chinese took body privacy seriously and conservatively, which means generally no one would allow others to see his or her naked body, not to mention to share a hot springs bath with others. Even a man would prefer a private and exclusive bathroom rather than sharing with female family, recorded as a rule in *Liji*. Therefore, public bathing was once hardly acceptable, leading to the very late introduction of public bathing in Song Dynasty (960 to 1279 CE). But how was the conservative thinking changed? During the very prosperous time in religion in Tang period (618 to 907 CE), Buddhist temples provided accommodation for travellers; in the Song period, temples even provided travellers and travelling monks with food, accommodation, and bathing facility (You, 2010). People of the time hence naturally rationalise the idea of public bathing from the sharing bathing practices of the monks who consider human body as merely a shell of the soul, parallel to any non-living things that are asexual, so that body privacy is not an issue when purifying soul through bathing. This manifests an important idea of Buddhism that people should not cling to physical world, including body and object.

The idea of the godsend also reveals how ancient Chinese viewed nature. Hot springs had always been considered as a special gift from gods, which makes the water unusual; the places of emergence of hot springs hence had been considered as the space where human can propitiously communicate and harmonise with gods or the universe through the contact with hot springs and the beneficial ‘*qi*’ therein. Consequently, with a strong sense of class and the divine right of emperors in ancient Chinese culture, most of the extraordinary hot spring resources were considered as being owned by emperor who was regarded as ‘the son of heaven’. Many hot springs sites hence had been built as the monarch’s holiday retreats, or sometimes even the second palace, which formed a special culture of discrete palace among the hot spring culture.

The idea of balneotherapy⁵ of hot springs spa can be a good example to elucidate the difference between Chinese and the Western regarding the views towards nature. The ancient Chinese believed the balneotherapy effect starts from mental to physical, whilst the western’s idea was more of from physical to mental. For instance, the Chinese hot springs spa was relatively simple because soaking without doing anything was essential, to reach the status of

5. The treatment of disease by bathing.

‘emptiness’ of Buddhism, or to attain enlightenment of the harmony with nature to purify bathers’ spirit as the principle of Taoism. As a result, the body then can obtain a better cure from the quality of hot springs. On the contrary, the Romans believed the effect was formed by the combination of adequate exercise, different temperatures bathing and even massage, through the various physical and sensational interventions to get body relaxation, so as to eventually achieve mental refreshment.

The hot spring bathing culture was often inevitably involved with luxury imperial palace and dissolute enjoyment. Emperor Taizong of Tang officially led his vassals to visit the Mt. Li hot spring after the construction of his discrete palace, and showed his honoured inscription ‘Hot Spring Inscription’, in order to deliberately reveal his hard efforts of managing government affairs beyond his fancy for the site with the mention of his suffering from rheumatism for years amazingly cured by the hot springs (Schafer, 1956). The inscription also reveals his deep concern about his hot spring enjoyment incurring the impression of his pleasure seeking and duty-neglecting attitude to his people. Unfortunately, his descendant, Emperor Xuanzong of Tang, without learning from it, splendidly built Huaqing Palace for having ultimate enjoyment with his consort Yang, one of the four most beautiful and attractive women in ancient China, leading to the ignorance of government duty and eventually the fall of the Tang Empire. Huaqing Palace of Tang was abandoned and became a ruin thereafter for around nine centuries. What’s interesting and puzzling here, is that a place that has ‘the best hot spring in the world’ and is renowned for exclusive enjoyment of emperors had no longer made the later emperors yearn for. Moreover, the abandoned palace has been being kept living incorporeally in Chinese mind by countless productions of poem, literature and painting until now, revolving around the story of the romance that actually warns and admonishes the world that people should not lose good will and responsibility for the pursuit of ultimate enjoyment and material world. Notwithstanding we do not know what is the reason that the following emperors of the nice centuries left the site abandoned, we can still sense that those texts and arts of warning all the time should be of significant influence. Therefore, this case shows that what the later generations inherited from Huaqing Palace of Tang, is not a heritage site, rather, a wisdom from the imperishable warning story that will never disappear like the ruin of palace. This reflects something essential regarding the idea of heritage of ancient Chinese, that heritage is something to pass on wisdom between generations. It implies people did not cling to the forms of heritage, as well as the status of the fabric, which also reflects the idea of impermanence of physical world in Buddhism.

4.4 Four Schools of Thought

The case study elucidates how Chinese cultural heritage, tangible and intangible, is profoundly influenced by the four thoughts practiced in the daily life of ancient Chinese, from plebeians to monarchs. Apart from further understanding essential values or ideologies of the four thoughts regarding nature and the universe that cover the cultural characteristics presented in the foregoing Huaqing case, this chapter also attempts to explore the ancient Chinese's idea of heritage, as well as the idea of heritage conservation.

4.4.1 Four Schools of Thought Embedded in Cultural Heritage

To protect the value of cultural heritage, one must have adequate understanding of the unique views and values of ancient Chinese towards nature and the universe, and acknowledge their significance in heritage conservation, as these not only have affected the way ancient Chinese interacted with natural environment, but also have reflected common values of the ancient people.

Chinese culture has been inheriting and developing for more than five thousand years. With a variety of cultural contents, four among them have been rooted as the foundation of people's lives. The four schools of thought not only have affected in many aspects of life, but also jointly formed as a common value system of people, as one can easily find a cultural heritage example as Huaqing Palace with the applications of these four thoughts. In addition, the four schools of thought have a notable feature. The four thoughts are seemingly distinct whilst some essential ideas between them are similar and supportive with each other, meaning they developed respectively but had influence on each other (Zhang, 2018). Therefore, in some respects, such as the view on nature and the idea of heritage, the four schools of thought coexisted without conflict; as a result, it has formed the conditions of shaping common values in ancient Chinese minds. This feature therefore has made significant influence directly and explicitly on Chinese cultural heritage, ever since they were created in ancient time. The four schools of thought are Buddhism, Taoism, Confucianism, and *I Ching* (also known as Classic of Changes). In view of the profound contents of the four thoughts, the chapter only focuses on the most associative parts affecting Chinese cultural heritage.

4.4.1.1 Buddhism

Buddhism is a religion that has been introduced into China from ancient India (2 BCE), with the actual meaning of the teaching of the Buddha, rather than the worship towards god Buddha, which is hence more of a philosophy compared with other religions. Buddhism's main doctrine is to get rid of mental suffering and reincarnation through the awareness of mind, emphasising impermanence and the absence of self and of the perceived world. The idea of impermanence underlines that the status of all things will not last forever, and that things that exist will eventually come into vanishing, which implies clinging to the perceived world hinders uncovering wisdoms (Weber, 1958). It highlights the harmony between the empty mind and the perceived world of mind. These ideas seem to be profound and hard to understand, whilst they are fundamental to the perspective and attitude of how ancient Chinese treat the material world. A common presentation can be seen the high application of timber structure in traditional Chinese architecture (Clarke, 1997; Peleggi, 2012; Winter, 2014). As wood is considered as a living thing with life and death as human beings, also implying habitations are supposed to be occupied for a limited period of time, just as a human body. Moreover, the renovation or restoration of an old building was often regarded as another 'rebirth' or as a way of respecting ancestors or gods (Qian, 2007). In contrast, stone was regarded as a lifeless material, and therefore masonry was more used in non-residential structures such as tombs, monuments and bridges, for taking advantage of its durable properties.

4.4.1.2 *I Ching*

Another school of thought that is easier to be associated with Chinese heritage is *I Ching*. *I Ching* is one of the most ancient classics in China and was honoured by Confucians as one of the must-study Five Classics. Similarly, Taoism borrowed some concepts from *I Ching*, including *yin* and *yang*⁶ and the Five Elements/Phases, to integrate into some essential concepts of Taoism. *I Ching* presents a primary view of the philosophy and cosmology of ancient Chinese, in the interactions between all things of the universe. It is generally believed that its theory is based on the interactions of cosmic stars, which can be analogized to the concept of Universal Gravitation in astrophysics. It uses the alternating and vicissitudinous

6 Lit. 'dark-bright', 'negative-positive', which is used to describe how seemingly opposite or contrary forces may actually be complementary, interconnected, and interdependent in the natural world, applied in *I Ching* and Taoism.

characteristics of *yin* and *yang* to describe the state of harmony and disharmony, and of auspiciousness and inauspiciousness in all things in the world; it also uses the Five Elements (i.e. the metal, wood, water, fire and earth) that are mutual generative or destructive reciprocals to describe the characteristics of everything in the world presented by the influence of *yin* and *yang*. Notwithstanding *I Ching* is mainly used for divination, its applications have extended to traditional Chinese philosophy, religion, medicine, astronomy, arithmetic, literature, music, art, military and martial arts, with modern applications such as the traditional Chinese calendar⁷, traditional folk therapy, *Feng Shui*, traditional Chinese medicine, fortune-telling, date selection, *Tai Chi* (i.e. supreme ultimate boxing) and *qigong* (i.e. life energy cultivation), which all become important cultural heritage in Chinese society nowadays.

The emphasis on the concept of harmony/auspiciousness and disharmony/inauspiciousness presents on the environment aspect as *Feng Shui*, which is a well-known knowledge for selecting location to build and planning, including locating palaces, villages and cemeteries and planning architecture layouts. Based on *I Ching*, *Feng Shui* also highlights the harmony between human (including built environment), nature and the universe. It uses ‘*qi*’ to explain the state of the harmony between human and environment (built and natural), which is influenced by the motions of the cosmos and the changes of any other things (including human and environment)(Simons, 1996). In the interaction with nature, as long as the movement of *qi* is taken into consideration following the principle of harmony, the resident will naturally be beneficial from the auspiciousness state of environment. Through the application of *Feng Shui* in locating, orientation and layout planning, people can acquire such ideal place of residence (Hwangbo, 1999).

Feng Shui mainly contains two schools, namely *Luan Tou Pai* (i.e. Form School) and *Liiqi Pai* (i.e. Compass School) (Figure 4-6). Two schools are different in approach whilst they are both based on the theory of *I Ching*, therefore they do not contradict each other. The first school has strength in selecting terrain features of mountain and water as well as the natural environment outside the building (Mak & Ng, 2005). The principle is ‘back to *yin* and embrace *yang*’, ‘there must be *qi* in a place where is surrounded by mountains and rivers’ (Marafa, 2003); the surroundings condition of Huaqing Palace is such a example (Figure 4-2). Many

7 The Chinese calendar is a lunisolar calendar which reckons years, months and days according to astronomical phenomena. It also contains a method to guide Chinese people in selecting the luckiest days for weddings, funerals, moving, or setting up business, which was developed through the principles of *I Ching*.

principles of this school have been manifested with environmental and ecological science (Han, 2001; Kiker, Bridges, Varghese, Seager, & Linkov, 2005). The other school claims that ‘human thrive because of house, house exists because of human, both support each other and interact with the universe.’ The main approach is based on *Bagua* (i.e. eight trigrams) and astrology (Kiker et al., 2005), it is therefore difficult to explain its theory in a scientific way, whilst it can use ‘*qi*’—analogy to invisible air current or energy—to help explain the influence on the occupant from the orientation and spatial layout of the building. The approach is to calculate and conjecture jointly according to the fated, temporal and spatial conditions to select the best location and layout of the building, including locating respectively the master’s, elders’ and youngers’ room, hall, kitchen, toilet, water, drainage and so on, and even to decide the dimensions of important structure components such as doors, windows, beams, columns (Figure 4-6).

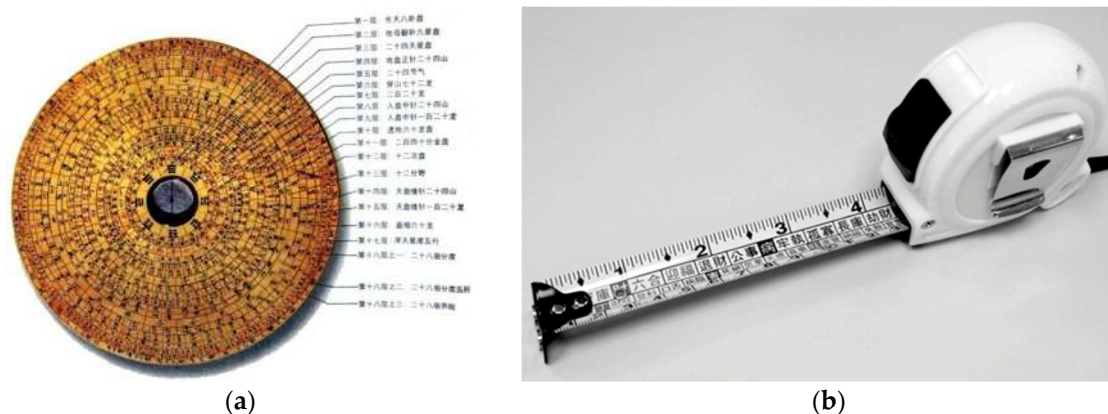


Figure 4-6. (a) *Feng Shui* compass. Source: Wikimedia ‘*Feng Shui*’; (b) *Lu Ban* ruler, made as a modern tape measure. Source: Author. Legend: upper Chinese words show auspiciousness and inauspiciousness scales for the residence of the living people, the lower Chinese words for the deceased.

4.4.1.3 Confucianism

Confucianism is a humanistic thought and philosophy founded by Confucius (551–479 BCE). It is an active thought highlighting the self-cultivation of morality, emphasising that *ren* (i.e. humaneness) and *li* (i.e. etiquette and courtesy) complement each other to practice ethics so as to establish social harmony and good customs (Weber & Gerth, 1951). With harmony as the central concept (Li, 2013), ancient Chinese were influenced by Confucianism and had an active attitude of practice, presenting in many aspects of daily life. Confucianism considers

complying with the etiquette as a performance of intrinsic respect and benevolence to all things, including people, gods, nature and objects. Since everyone has different roles to play in society and family, in order to make society harmonious, compliance with etiquette helps play a good role. The *li* emphasises playing an appropriate and courteous role, rather than on seeming hierarchy or classification (Li, 2013). For example, a man may simultaneously plays two roles, as a father and also as a son, which means he has different etiquettes to follow to treat his children and parents differently. It also prominently reflects on architecture; for instance, different forms of roofs, building heights and exterior colours all present different roles of the occupants. Not to go beyond our own roles and proprieties to present a bluff status is an essential respect expression to others (Wang, Wu, Dou, Xie, & Wang, 2016). The interior layout of a building or the layout of building complex should be able to show the order of seniority or formality between young and old, male and female, host and guest, and public and private, which is also a way of practicing courtesy. In addition, the concept of the ‘happy/golden mean’, through the principle of central axis and symmetry, is manifested in the layout of Chinese buildings, which preach balance and impartialness in individual and society (Wu, 2013), as the foregoing elucidation in Huaqing case (Figure 4-2). In terms of the architectural decoration, architectural art painting, porcelain ornaments, wood carving, and clay sculpture generally have a purpose of enlightenment of morality through the content of parable.

4.4.1.4 Taoism

Taoism is an ideology originating in ancient China and later developed into a religion. The main doctrine is the pursuit of naturalness, as well as the learning of truths and philosophy from nature, for the purpose of achieving the freedom of mind (Weber & Gerth, 1951). As aforementioned, Taoism contains the concepts of yin and yang and the Five Elements of *I Ching*, mainly for conceptualising one of the central concepts—harmony—towards the harmonious status of *taiji* (i.e. the origination of *yin* and *yang*) and *wuji* (i.e. limitless, untimeless). The difference is that, instead of being regarded as a profound and mentor-based knowledge as *I Ching*, Taoism facilitates and embodies the concept of *yin-yang* and the Five Elements through the understandable truth and phenomenon of nature. For instance, it usually uses characteristics of water, animals, and plants as metaphors or explanations. It has formed prominent influence in design philosophy of Chinese’s traditional architecture and landscape, which mainly brings naturalness and boundlessness into a limited built environment. For

instance, by virtue of the attachment and longing for nature, traditional Chinese garden tries to present an infinite prospect of Taoism—oneness/unity of nature and human—by bringing mountain, lake or sea into a garden to make garden a miniature of the boundless nature. Through applying the principle of harmony between yin and yang, generative reciprocals of the Five Elements, and learning from nature into design, the Chinese architecture and garden can therefore achieve to shape a poetic prospect that is an enlightenment prospect where makes it easy for people to perceive the ‘oneness/unity of nature and human’ from the physical world.

4.4.2 Presentations of the Four Thoughts on the Idea of Heritage and Heritage Conservation

After understanding the peculiar view jointly formed by the four thoughts towards nature and the universe, we can further explore how these four thoughts shape the idea of heritage and of heritage conservation in ancient China.

Confucianism, Taoism, and *I Ching* have a similar idea regarding tangible and intangible heritage, more precisely, tangible part and intangible part of heritage. The three thoughts all consider intangible part of heritage is more important than tangible part (Xuecai, 2008b; Zhu, 2012). It is elucidated by the *tao qi lun* (i.e. discourse of *tao* and device; *tao* means the way and the truth of all things of the world whilst the device means human-made stuff). The principle of ‘*zhong tao qing qi*’ (i.e. emphasis on *tao* rather than on device) highlights that *tao*, including the spirit, wisdom, knowledge, attitude, skill, and manners that exist behind the human-made stuff, is what people should make effort to cherish and pursue. Based on the principle, it is notable that ancient Chinese judge whether a heritage is of merit to maintain by judging what is the intangible part of a heritage (i.e. *tao*), and how important the *tao* is. It is different with the way that the modern values-based approach considers first—what is the value of the heritage? And how significance is the value?

The principle reflects on numerous cases with reconstruction of built heritage. The authenticity of the fabric of built heritage is hence considered as relatively lower priority regarding heritage conservation of ancient Chinese, whilst it does not mean they did not consider authenticity as essential in heritage conservation. Confucianism highlights the necessity of authenticity of literature, as they consider literature is an essential form of wisdom of the author that can be passed on generations forever. Therefore, *shi jiao* (i.e. education by poetry) is preached and plays an essential role in Confucianism, which has also substantially influenced the values of ancient Chinese. A heritage (site) was considered of merit by

generations usually due to the mentions in poems of sages (Xuecai, 2008c). Along with the authenticity of literature, Confucius also emphasised the importance of living heritage community who is the real witness and practitioner⁸ (Xuecai, 2008b).

Yu indicates the system of worship ceremony and etiquette is the heritage conservation system of ancient Chinese (Xuecai, 2008b). Supported by Confucianism, the system has last for more than four millenniums since Yin dynasty, which underpins the foregoing principle of emphasising on intangible part of heritage. It is a system with official registration that features passing on dynasty and dynasty, recorded by *Liji* (the chapter of *Law of Sacrifices*) and the *Classic of History*. The worship ceremony and etiquette mainly encompass three categories, namely significant mountains and rivers, gods, and ancestors (including sages). Among them, ancestor worship played a critical role in the conservation of built heritage, as worship system and occasionally the order of emperor officially stipulated the protection area of the tomb of sages, which is similar with the way the modern heritage conservation protects a site with a surrounding area in planning and designation system (Xuecai, 2008a).

The ancestor worship, along with the four schools of thoughts have also embedded in Chinese traditional burial (Mills, 1992; Zhang, 2018). As *Feng Shui* also deals with the residence for the deceased, and claims that the *qi* between the deceased, the surrounding natural environment, and the universe will influence the *qi* between his descendants and the universe, as the result, the theory has become a belief of most of Chinese people, which perpetuates the burial culture. Consequently, the burial culture continuously reinforces the influence of the four thoughts towards the past and heritage, generation by generation.

As the foregoing section 4.4.1.2 reveals a critical point of *Feng Shui* theory—the change of occupant also means the change of *qi*. In other words, even though the surrounding environment looks unchanged, the *qi* of a historical building is still subject to not only the continuous changing influence by the motion of the universe (temporal factor), but also to the change of the occupant (fated factor), leading to the changes of harmony/auspiciousness and disharmony/inauspiciousness in different times (Xu, 2014). It is another influential feature regarding the idea of heritage conservation. It reflects ancient Chinese's idea of heritage conservation and reuse towards historical buildings—the preservation of the intact physical state will not necessarily benefit the future occupant in terms of *Feng Shui* condition as the way in the initial time; the later occupant tends to pursue the auspicious and harmonious status

8 Recorded in the *Analects of Confucius*, in which Confucius was describing that he was not able to manifest the etiquettes of Xia dynasty and of Yin dynasty due to the lack of the witnesses and practitioners.

all over again by appropriate renovation and reconstruction with accordance to the updated application of *Feng Shui*. Another relevant reconstruction circumstance can often be seen that ancient people reconstructed after the decay or destruction of a public built heritage that was originally created on the purpose of *Feng Shui* enhancement to a local area. In such circumstance, *Feng Shui* acts as knowledge as well as an intangible heritage itself to bring authenticity into the rebuilding of heritage in the present (Zhang, 2018).

Zhang indicates that *I Ching* (and *Feng Shui*) may be understood as an ancient manifestation of sustainability due to many similarities between *I Ching* and the concept of modern sustainability (Zhang, 2018). Both *I Ching* and sustainability highlight the maintenance of harmony over time between people and nature as the central concept, on the basis of an ever-changing world and the universe. Moreover, the idea of sustainability from the four thoughts also emphasises on something that can always pass through future generations, which is noticeably wisdom, something is expected to be inherited from the past generation, and something used to judge whether the tangible form of its bearer that we call heritage should be left and maintained.

In the pursuit of harmony in the ever-changing world, the ancient Chinese also understood that disasters do happen sometimes. The idea of resilience is also presented in the four thoughts, for instance as aforementioned, *shi jiao* (i.e. education by poetry) and the system of worship ceremony and etiquette are exactly the evidence in a way of system to avoid the eternal loss of the wisdom, once disaster happens to the physical bearer. Another common example is *zhang qao*, basically a model rule used by the chief carpenter (as the role of architect in traditional architecture) to design and record the size of all the main beams, girders and rabbets as the basis for the construction. It is often stored on the roof truss after completion, and can be easily applied in the future if restoration or renovation is necessary (Lin, Wu, & Hsu, 2009). The example also reveals the idea of resilience to recover quickly from disasters or unavoidable changes.

The foregoing discussions manifest author's argument that harmony is the central concept of the four schools of thought, regardless of some different interpretations and entry points. The conceptualisation of heritage and the conservation of heritage, both revolve around practicing the wisdom of the *tao* (i.e. the way and the truth of all things of the universe), in order to achieve sustainable harmony in mental world (Buddhism), in family and society (Confucianism), and in the universe (Taoism and *I Ching*), which have jointly formed a common value system of ancient Chinese that presents on cultural heritage and the idea of

heritage and conservation. Harmony is the core idea of the four thoughts, which comes with changes. Whenever changes happen, the wisdom is to pursue harmony. Whenever harmony status alters, changes are unavoidable to be made to pursue new harmony. Therefore, wisdom is something more likely to sustain, and the most important thing to be sustained through generations.

In the case study, how the Tang Dynasty used the pool of the former dynasty to integrate into the building of the contemporary pool, is exactly an applicable example of the wisdom of harmony, as well as the presentation of the views towards heritage, which resides in the relation between nature (hot spring and the universe), heritage (the pool) and people. Furthermore, for the Tang Dynasty, the pools of the former dynasties were heritage, whilst for modern times, the pools of Tang Dynasty are also heritage. This relativity shows that the principle of authenticity and integrity is characterised by the division of history into periods. In order to follow these two principles, the contemporary time needs to be frozen, so that change can be temporarily suspended, as Smith and Ashworth describe with discourses (Ashworth, 2011; Smith, 2006). However, in fact, change is always going on. This example of conservation and integration of the former pool in Huaqing Palace of Tang shows that whilst authenticity and integrity are important for heritage conservation, when time scale extends, change is natural and unavoidable. So, what is more important, is that how to keep and present the contemporary ideas and wisdom towards harmony and heritage, when change is happening. As such, this chapter rediscovers the ideas and wisdom of the past towards harmony and heritage from which the modern Chinese inherited without knowing.

Through the discussions of this chapter, the author summarises the characteristics of the idea of heritage and conservation of ancient Chinese and compares it with Ashworth's ternary discourses of modern global practice, as shown in Table 4-1. However, it is very surprising to see there are many parallels existing between the latest 'Heritage Planning' discourse and the ancient Chinese 'sustainability' discourse. As one can see the evolution of the conceptualisation of heritage in modern movement of heritage conservation is a shift from the perspective of science and technique to philosophy, as noted by Smith:

The dichotomy between tangible and intangible heritage needs re-thinking, and indeed, I posit all heritage is intangible. (Smith, 2006, 2015)

Notwithstanding this additional finding of the coincidence between the perspective of modern conservation and ancient Chinese perspective may need more evidence and discussion, the core theme of the finding—harmony between nature (including the universe), people

(including the context), and human-made world (becoming heritage in a later time) to accommodate changes, as well as the note of Smith in the last passage, both highlight a parallel idea that we should view and understand heritage from the intangible sphere, namely people, context and the bond with nature, and use harmony to connect tangible and intangible sphere and to accommodate changes amongst them. The author hence uses this essential idea for developing new methodology in the following chapters.

Table 4-1. Characteristics of the heritage discourses, modern global practice vs. ancient Chinese. (Compared with the ternary discourses of Ashworth (2011; 1994)).

	<u>Ternary Discourses</u>			<u>Chinese discourse</u>
	Preservation	Conservation	Heritage Planning	Sustainability
Focus	Object	Ensemble	Narrative(s)	Harmony
Goal	Protection	Adaptive reuse	Use	Practice
Justification	Value	Value/Re-use	Utility	Wisdom
Criteria/values	Intrinsic	Preserve purposefully	Extrinsic	Extrinsic
Authenticity of . . .	Object	Compromise	Experience	Experience
Change	Immutable	Adaptable	Flexible	Flexible
Temporal nature of value	Static	Metastable	Dynamic	Impermanent
Actors (who has authority)	Experts	Policy makers/Planners	Users	Users

4.5 Conclusions

Through addressing the very fundamental and peculiar idea regarding the view on nature and heritage, the author wishes to draw more attention on the rediscovery of the perspective and values of ancient Chinese. The finding highlights harmony is the central concept of the four schools of Chinese thought that influence the conceptualisation, constitution and conservation of cultural heritage of ancient Chinese. As harmony is a wisdom; using wisdom as a common language does help people understand relationship of critical things and achieve consonance to sustain the wisdom through generations, especially in the general circumstance that values (system) can hardly be dogmatised by text, which is exactly the main challenge of the values-based theory and relevant approaches based on protecting value, reviewed in Section 2.1. The author hence uses the harmony perspective to underlie the development of methodology in managing change in latter chapters, which features centring on the bond between heritage, context (i.e. people and something made by people) and nature and emphasising on two essential aspects—sustainability and resilience—to accommodate changes.

Whilst practitioners are revolved around the debate of what change is allowed and what change is not allowed for following the principle of authenticity and integrity, the finding of harmony also points out something significant prior to the debate, which is to understand why a heritage is kept until now and not abandoned over the time when there was nothing like modern heritage conservation. In other words, it is harmony that had been existing so that there was no destructive change happening. To understand what the conditions of the context or the attributes of the heritage were to facilitate harmony that results in survival, and what the changes that had been experienced through different times and contexts were, are in fact significant towards heritage conservation, as this is the very thing from the past, not as value is given today, and we can really learn from it. In other words, rather than sticking to the debate of what and why should be conserved, as the name of book of Lowenthal and Binney (1981) *‘Our past before us: why do we save it?’*, we should instead pay more attention on ‘why does it survive?’, then we will discern the significance of harmony, as well as the essence of sustainability and resilience, which are the two very aspects the author highlights in the proposed approach in the next chapter, no less essential than value with respect to change.

Notwithstanding such a view has long been rooted in the hearts of Chinese, it has been mislaid out of modern heritage conservation. It therefore should be recalled and acknowledged first, before a comprehensive understanding and protection of Chinese heritage value to be achieved. The author also wishes the limited finding could be an enlightenment to modern Chinese, who should resurrect the wisdom of ‘oneness of nature and human’ of the past, as well as the inner nature of pursuing and practicing wisdom as the top priority of life, so that the everlasting wisdoms will no longer be mislaid because of the pursuit of economic development.

Chapter 5 A Comprehensive Matrix Thinking Towards Intervention in Heritage Management: Water Heritage Helps

5.1 Introduction

The world is increasingly paying considerable attention to heritage conservation, whilst the role of water heritage that is supposed to be a significant contributor amongst all types has just started to be noticed¹. This is puzzling, as water heritage, in comparison with architectural or monumental heritage, definitely possesses more ecological, environmental, social and intangible elements, due to its direct bond with nature. The paleohydrology of water heritage not only enhances the value of heritage of the past, but also helps build a sustainable environment and society for the future. The indifference towards water heritage in heritage studies and conservation not only reveals the vulnerability of water heritage, but also reveals the prejudice and inadequacy of the current idea towards the protection of heritage value in natural and social sphere. The sustainability of vulnerable water heritage relies on the harmony between human demands and the changing conditions of natural environment (e.g. climate change) of the present and future generations. To conserve water heritage and simultaneously adapt to the evolving natural environment and social state, interventions are usually inevitable, whilst the current idea of intervention that is merely applicable to heritage fabric appears to be incapable of tackling management tasks on water heritage, as well as on any sort of heritage with nature content or issue. Contrarily, it makes water heritage stand out as a great example to help address the narrow view on intervention and help obtain an inclusive perspective for heritage conservation, which is the main purpose of this chapter to carry out theoretical discussion, following the philosophical discussion of the last chapter.

Minimal intervention is one of the most important theories in heritage conservation, which is also the focus of this thesis in theory because intervention is by all means critical to

¹ UNESCO has sought to explore the relationship between water and heritage since recent decades. The organisation helped to launch the theme of ‘Water and cultural Diversity’ at the 3rd World Water Forum in 2003. In 2013, ICOMOS launched a conference ‘Protecting Deltas, Heritage Helps!’ in Amsterdam in order to promote and support the important role of heritage in protection in deltas, which resulted in the *Statement of Amsterdam* (Willems & van Schaik, 2017).

harmonious environmental management. As reviewed in Chapter 2, minimal intervention has developed the degree of intervention, mainly for applying on built heritage, that turns out to be merely a descriptive function, whilst it has also developed another practicable tool, heritage impact assessment (HIA), that turns into a must-know statutory tool when dealing with changes or interventions in environmental management practice involving cultural heritage. Therefore, the author seeks to make an advanced discussion and improvement towards intervention theory in this chapter, subsequently as the theoretical foundation to make further discussion in HIA in Chapter 6.

Starting from addressing the importance of the idea of intervention with respect to heritage management, section 5.2 unfolds the weakness of the current narrow intervention theory through literature review. The tendency of reification and dichotomy in heritage conservation has caused separations of nature from culture, people from fabric, intangible from tangible, and even context from foreground, hence reinforcing the narrow view of intervention. The narrow view represents a focus on the fabric of heritage; even a shift with the inclusion of setting is still rather limited. There still exists ignorance towards people, society, and nature aspect, which are interdependent with or part of heritage. The chapter hence also applies a discourse analysis method described by Van Dijk as ‘the systematic and explicit analysis of the various structures and strategies of different levels of text and talk’, for addressing the confined concept of setting in terms of intervention from influential practices and charters of international level. Since water heritage features possessing all those spheres, through a further understanding of water heritage in section 5.3, the author attempts to explore the potential of water heritage for improving the idea of intervention in tackling aforementioned issues, and to highlight its importance in cultural heritage. Section 5.4 then works on the development of a new inclusive perspective of intervention, supported by several water heritage examples. It mainly addresses two issues, respectively in two dimensions, which are also the research questions of this chapter: 1) Should practitioners focus on the fabric of heritage in terms of intervention? And, what else should also be protected and considered in terms of intervention? And in the second dimension, 2) Is the assessment of changes solely relies on value aspect able to comprehensively identify and cover critical impacts that are caused by intervention? The outcome of the chapter is expected to not only provide a more comprehensive way of thinking with two dimensions to replace the current intervention theory, but also benefit the improvement of the existing HIA approach, as well as other applications dealing with environmental management issues, which will be presented in the next two chapters.

5.2 Literature Review

5.2.1 Narrow View on Intervention—Reification

It has been indicated that the tendency of reification is formed along with the historical development of heritage conservation. Due to a large number of monumental heritages and historic architectures damaged by wars in Europe in the 19th century, the repair and restoration demands prompted the rise of architecture conservation, leading to a tendency of focus on fabric in heritage conservation (Jokilehto, 2007; Pendlebury, 1999). This reification tendency has gradually led to the neglect of people and nature, and the separations from fabric, which is well described in Smith's book (2006) as authorised heritage discourse (AHD). The discourse emerged from nineteenth century debates in western European architectural and archaeological scholarship about the need to preserve fabric that scholars deemed to be of innate and inheritable value (Jokilehto, 1999; Smith, 2006).

Along with the reification, the long-standing rift between natural and social sciences has also done much to shape how environmental protection and the conservation of cultural heritage are practised today (Harmon, 2007). These two causes jointly exacerbate the tendency of dichotomy in heritage conservation, which separates nature from culture, people from fabric, intangible from tangible, and even context from foreground, hence leading to a rather narrow view of heritage conservation.

With the emphasis on the principle of authenticity that derives from the foregoing perception of architectural heritage conservation, some related principles for treatment measures had hence been developed, of which minimal intervention is the critical one with respect to heritage management (Orbaşlı, 2017). The introduction and review of minimal intervention has been made in Chapter 2. With increasing debates highlighting intangible elements involving nature, community, and social sphere, the current idea of intervention gradually reflects its inapplicability due to its focus on fabric. The degree of intervention has eventually become a merely descriptive function in heritage management whilst the minimal intervention theory still survives by hiding under the umbrella of the principle of authenticity, which has lately evolved into the foundation of Heritage Impact Assessment (HIA). The current intervention theory and HIA both revolve around material without considering nature and people (including social sphere) (Pendlebury, 2013; Pendlebury, Hamza, & Sharr, 2014). The chapter hence argues it should be improved to contain nature, community, and social

sphere, so as to fulfil the demand of tackling management tasks towards all sorts of heritage, with a more inclusive consideration.

5.2.2 Dichotomy and Confined Setting in World Heritage

The dichotomy tendency exists in the practice of heritage conservation of international level, particularly World Heritage system that has been considered by many as the model of conservation in both cultural heritage and nature. In the framework of World Heritage Convention, there is a clear division of natural and cultural heritage from the very beginning, and separate criteria for assessing the listing. Even the committee of experts has been working separately on the review of nominations and the follow-up supervision and management. Notwithstanding there is a mixed category established later due to the presence of sites with bilateral features, it is merely a new category that allows a heritage to be inscribed through both cultural and natural criteria simultaneously. There is still no substantial enhancement of understanding and integration towards the bond between the two sides, not to mention to what extent the general single category (i.e. natural heritage or cultural heritage) can achieve adequate interdisciplinary dialogue between two sides (Taylor & Lennon, 2011). Although cultural landscape was later added as a new category in World Heritage system in 1992 in order to enhance the integration between nature and culture, the performance is still far from satisfactory. The added category has hardly been a challenge to the dichotomy, as well as the AHD within the system. Nature is still considered as merely resources for human to consume, not a bond to culture. It is undeniable that the structure of separating natural and cultural heritage in WH system hardly benefits the integration of the two sides; instead, it seems to be even a facilitation of the dichotomy tendency, which in turn has reinforced and exacerbated the issues.

Whilst the idea of intervention was being developed over the last century, the awareness of the importance of the ‘setting’ of cultural heritage was also raised. It has led to many discussions in World Heritage system, as well as many statutory requirements established from international to local level, holding the concept that the setting of a heritage place should also be protected in heritage conservation practice. The original 1977 operational guidelines of the World Heritage Convention show that the protection of a World Heritage site has traditionally focused only on the core area in which a World Heritage site is located. It was not until 1980 that the Convention revised their operational guidelines to include the protection of the broader surroundings under the concept of the buffer zone. It was recognised that the universal value of

a cultural World Heritage site could be jeopardized by alterations in its broader surroundings. The later 2005 revision of the operational guidelines further clarified and strengthened the concept of the buffer zone in practice (ICLAFI); it is a key point for maintaining the value of aesthetics and integrity of a heritage ensemble (Martin, 2008).

However, apparently, the purpose of introducing buffer zone in WH is merely for protecting the immovable fabric and in particular the aesthetic of landscape (García-Esparza, 2018). As described in article 104 of operational guidelines, ‘For the purposes of effective protection of the nominated property, a buffer zone is an area surrounding the nominated property which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the property. This should include the immediate setting of the nominated property, important views and other areas or attributes that are functionally important as a support to the property and its protection’, one can perceive that the guidelines consider ‘the setting’ as an extensive area to keep the status of the fabric unchanged by restrain the use of local community. It does not consider community as part of the heritage; it does not regard heritage as a cultural and social process of which the community is essential elements (Byrne et al., 2003; Smith, 2006; Waterton & Smith, 2010); and it does not consider community as usually the bearer of intangible elements of the ‘property’. ‘Property’ is the term used in the operational guidelines, which implies how WH system sense cultural heritage. Inevitably, to some extent the global practice are influenced by WH practice with the result of neglecting intangible elements, community and nature (Musitelli, 2002; Smith, 2015), which also results in the advent of Intangible Cultural Heritage Convention (ICH) (Smith, 2015).

5.2.3 Confined Setting—Inconsistency in International Charters

Following the discussion of the setting in WH system, it is also worthwhile to see how international charters adopt and evolve the idea of setting in terms of heritage conservation, as these charters are regarded as no less influential to global practice than WH system. The *Athens Charter* (1931) is the first one to mention it in terms of urban planning. Article 3 states that in new building circumstances ‘the character and external aspect of the cities in which they are to be erected should be respected, especially in the neighbourhood of ancient monuments, where the surroundings should be given special consideration’. Following the *Venice Charter* (1964), similarly, in terms of design, article 13 states that additions can only be allowed if they ‘do not detract from the interesting parts of the building, its traditional setting, the balance of

its composition and its relation with its surroundings’. Then the first to address the rigidity of legal requirement in terms of new buildings in historic built environment is the *Declaration of Amsterdam* (1975), it states ‘as far as possible, the application of building codes, regulations and requirements should be relaxed to meet the needs of integrated conservation’ and ‘In order to solve the economic problems of integrated conservation, it is important—and this is a decisive factor—to draw up legislation subjecting new building to certain restrictions with regard to their volume and dimensions (height, coefficient of utilisation etc.) that will make for harmony with its surroundings’. Other examples include the *Washington Charter* (1987), it notes, ‘the introduction of contemporary elements in harmony with the surroundings should not be discouraged since such features can contribute to the enrichment of an area’; the *Burra Charter* (1999) states in article 8 ‘new construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate’. As we can see from the foregoing charters, they generally highlight the same point—the harmony between the setting and the physical heritage; however, one can easily perceive ‘the harmony’ merely refers to aesthetic harmony.

A later document seems to be more inclusive. ‘*Xi’an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas*’ is the charter mainly focuses on the issue of the setting (ICOMOS, 2005). Article 1 states ‘Beyond the physical and visual aspects, the setting includes interaction with the natural environment; past or present social or spiritual practices, customs, traditional knowledge, use or activities and other forms of intangible cultural heritage aspects that created and form the space as well as the current and dynamic cultural, social and economic context’; article 4 states ‘cultural traditions, rituals, spiritual practices and concepts as well as history, topography, natural environment values, use and other factors contribute to create the full range of a setting’s tangible and intangible values and dimensions’. The charter clearly defines the setting in a more inclusive way. And in article 8, it clearly stresses the requirement of applying HIA on both heritage and the setting, noting ‘Heritage impact assessments should be required for all new development impacting on the significance of heritage structures, sites and areas and on their settings’. The document consequently facilitates the subsequent advent and development of the HIA framework for WH properties, namely ICOMOS’s HIA (ICOMOS, 2011), that sets out the detailed principles for undertaking HIA on both heritage and the setting. Notwithstanding it seems that Xi’an declaration and ICOMOS’s HIA both highlight the importance of setting in conducting HIA, the inconsistency between them reveals a broader view of intervention proposed by Xi’an

declaration has not been applied to ICOMOS's HIA. As article 5-5 of ICOMOS's HIA states 'Assessment of impacts on setting refers to perceptible visual and aural (noise) effects that can be appreciated at a given time', and article 5-6 states 'Indirect impacts occur as a secondary consequence of construction or operation of the development, and can result in physical loss or changes to the setting of an asset beyond the development footprint.' These two articles reveal that the impacts on setting are still considered as merely physical changes, visual and aural effects to the surroundings or place. It implies the setting is more of a place rather than a 'context' that contains people, nature and social sphere; it also implies the impacts on people, nature and social aspect can be ignored. Unfortunately, it seems that the global practice has not caught up Xi'an declaration's idea of setting in terms of intervention, whilst the global practice has widely influenced by the ICOMOS's HIA guidance. We hence cannot help but wonder whether international charters have selective influence when confronting powerful AHD. However, there is a noticeable cause that is worthwhile to be addressed here, is that Xi'an declaration defines setting and suggests protecting heritage and the setting in heritage conservation first, then mentions HIA should consider heritage and the setting afterwards. These two parts are mentioned separately, which makes readers think they are talking about two things, for instance, the former can be heritage legislation and the listing system, and the latter is HIA practice. In other words, the declaration does not describe and link the setting and HIA through the description of impact or intervention, such that the readers can hardly perceive the connection between HIA conduction and the inclusive descriptions of setting. The author hence argues it is importance to elucidate the idea of setting and HIA through an understandable framework of intervention, which is a matrix perspective the author is going to propose later.

5.2.4 Summary

Through the foregoing reviews and discussions, one can catch the current misled ideas of the setting and landscape in conservation practice. Notwithstanding landscape features the combination and interaction of nature and human activities, there is often a tendency to merely focus on aesthetic value in heritage conservation. In terms of the idea of setting, landscape seems to play a role that merely gives concern to the aesthetic harmony between heritage and the surrounding environment, revealing that the values from intangible elements, nature, people and social sphere are often excluded and overlooked by the current dominant idea. Therefore, we can conclude from the discussion of Section 5.2 that it is the focus on physical

world, i.e. the fabric and the aesthetic harmony between the fabric and surroundings (i.e. ‘setting’ in practice), which impedes the improvement of intervention theory, such that the theory cannot catch up with the progress of heritage conservation that currently highlights the importance of people, nature, and social significance.

But how about ‘cultural landscape’? As quoted from Taylor & Lennon (2011), ‘Cultural landscapes are intended to increase awareness that heritage places are not isolated islands and that there is an interdependence of people, social structures, and the landscape and associated ecological systems’, which addresses exactly what the missing points are towards the confined idea of the setting and landscape. Notwithstanding the recognition of the cultural landscape values of traditional people as being worthy of WH listing can empower these groups in terms of heritage significance resulting in the advent of cultural landscape in WH criteria, and there also have been some approaches based on cultural landscape developed and promoted in global practice, such as 2011 Recommendation on the Historic Urban Landscape (HUL approach, reviewed in Section 2.1) (UNESCO, 2011b), research indicates the implicit concepts of integrity and authenticity in cultural landscape of WH are still lacking in dynamism that allows diversity and contemporary evolution in community and societal sphere (García-Esparza, 2018). In other words, some current conservation principles, such as integrity, authenticity and minimal intervention, that are of attribute of focusing on physical world exclusively, cannot accommodate to the concept of cultural landscape. It also reflects the fact that the values system that HUL approach seeks to establish and promote through a way of doctrinaire text is hardly practicable to many. The author hence suggests rather than merely relying on these cultural landscape approaches, we need instead to seek a fundamental rethinking of the idea of heritage, particularly with a rethinking of the idea of intervention that is of inclusive considerations targeting heritage, setting (i.e. community and landscape), and nature and containing cultural, social, and ecological sphere. The finding of last chapter—harmony concept residing in the bond between nature (including the universe), people (including the context), and human-made world (becoming heritage in a later time) to accommodate changes can definitely address this need. Also importantly, an effective form of approach to support the conceptualisation of new conservation approach is critical to the applicability, which is considered in the development of the new intervention approach proposed at latter section of this chapter.

5.3 Overlooked Water Heritage

Before developing a new perspective of intervention in the chapter, the author intends to explore the contents and features of water heritage by the discussion of classification, so as to be used to help conceptualise the new perspective. Since World Heritage is currently the most well-known and influential practice in global practice, the following section discusses the classification of water heritage to explore whether water heritage accounts for a significant proportion in World Heritage; whether World Heritage covers the majority of the important types of water heritage; and how water heritage is protected and managed by different conservation programs of international level, for the purpose of understanding its diverse content (e.g. architecture, monument, landscape, and infrastructure), multiple dimensions (e.g. tangible, intangible, and social significance), and the prominent feature of 'living', so as to assist the discussion of intervention in the later part of article.

5.3.1 Classification of Water Heritage

As water heritage features possessing more ecological, environmental, social and intangible elements, it is supposed to be high-profile in heritage conservation. However, it is not the case due to the reification of heritage and AHD that has the tendency of preferring architectural and monumental heritage (Smith, 2006). In fact, so far water heritage has never been formally applied as a category of heritage; it has hardly been addressed in any international charter and document; it has also hardly stipulated in legislations or statutory documents in national and local level; and there is not even a definition given in literature. The chapter does not aim at criticising this circumstance, whilst the chapter attempts to use water heritage to find some new perspectives; it is hence worthwhile to further understand what water heritage is, before working on the development of intervention perspective.

Since water heritage covers a variety of forms of cultural heritage such as architecture, monument, infrastructure, and cultural landscape, it is worthy of exploring what is the content of a heritage that can be considered as a water heritage, what is the dynamic role it plays between societies, nature and governance, through the discussion of classification. Due to the scarcity of research with respect to water heritage thus far, literature regarding the classification or typology of water heritage is also limited. Pangare and Pangare, Lemaistre, and Jigyasu (Willems & van Schaik, 2017) present their research articles with the typology of water heritage by introducing some significant water heritage examples worldwide. These

papers mainly sort water heritages by type of infrastructure. They also stress some points or issues regarding water heritage in common, including lack of maintenance, pollution in water environment, discontinuity of traditional agricultural practices (i.e. the issues of intangible value and living heritage), and intervention from modernization.

Cotte (2017) also presents a typology framework of cultural water heritage in a thematic study, which helps identify the components of a heritage and evaluate its significance. The study also provides two important characteristics. Firstly, water heritage often falls into more than one type, because they have either multi-functions or multi-purposes. Secondly, the values of water heritage are often difficult to comprehensively understand and are likely to change over time, because water heritage is prone to integrate into the heritage ensemble and in many cases as part of a heritage, which means its value and importance may take more efforts to discover, understand and recognise. For instance, the Pont du Gard (WH, in Gard, southern France), demonstrates that World Heritage Convention initially recognised it as an outstanding Roman monumental architecture, then at a very late stage recognised the OUV as a Roman aqueduct.

Apparently, it is difficult to investigate the pattern water heritage presents in cultural heritage worldwide, however, we can at least explore the pattern of water heritage in World Heritage. This chapter identifies water heritages or components from cultural World Heritage. However, the research investigates and identifies water heritage from WH without limiting the scope within the recognised OUV of water content so as to obtain a better understanding. The study has undertaken a literature search of all the cultural World Heritage sites and, as of January 2016, examined a total of 834 both cultural sites and mixed sites (cultural and natural mixed). Although many of the water heritages co-exist as a part or a component within an architectural or monumental heritage site and are not currently recognised as a so-called ‘water heritage site’, this study still identifies them as water heritage by their value and importance. The criteria for identification encompass WH site with a description regarding the significance of water content in the publications of World Heritage Convention, and WH site with published research due to the significance of the water content.

Amongst the 834 cultural World Heritage sites, 144 possess water heritage content, which accounts for 17 per cent (Figure 5-1, left; Appendix B). The result demonstrates that water heritage accounts for a considerable proportion of the World Heritage. It means water heritage is, by all means, an important category in heritage conservation. Since water-related issues have become a major challenge in heritage conservation, this study also explores how water

issues affect the World Heritage sites. The author investigated further, through the publications of World Heritage Convention, and identified another 60 sites (non-water heritage) with a significant water issues that accounts for 7 per cent (Figure 5-1, left; Appendix C), meaning they are facing water-related issues or are at risk of damage due to water or its water environment. It implies that some interventions may be inevitable, in order to protect the sustainability of those sites. The intervention would generally be applied either on the heritage itself or on its water environment, which shows that these heritages have similar conditions with water heritage in terms of necessary intervention towards its water environment.

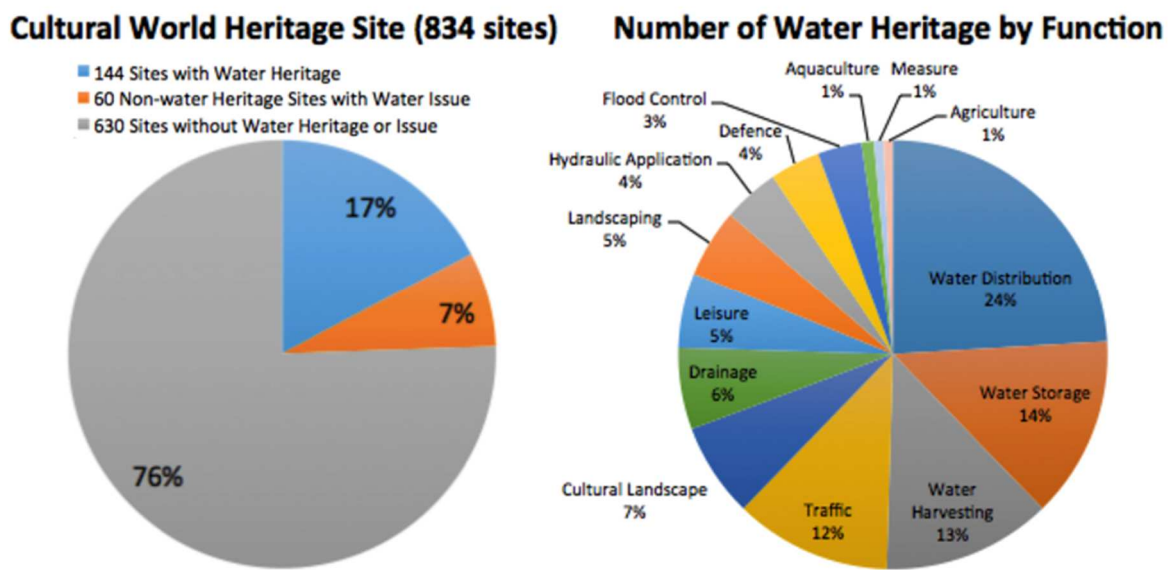


Figure 5-1. The pattern of the water heritages in the cultural World Heritage. Source: Author.

This study further explores their composition, by investigating their infrastructure types and functions. The 144 water heritages identified show a wide range of infrastructure types, which cover most of the important types of water heritage in the world (Appendix B). These 144 water heritages encompass 31 infrastructure types, including *qanat* (i.e. *aflai*, *karez*), Roman aqueduct, baths, irrigation waterway, water lifting, drainage, cistern (e.g. *chultun*), reservoir, well, water garden, wetland, rainwater recovery, flood control, canal, harbour, boat-lift, step well, hydraulic power application, pumping station, sewage, *Chinampas* (floating farm), bridge, defence system, pile-dwelling, dam, dyke, shipyard, whaling station, pearling industry, shellfish mound, and reclaimed land, which presents the pattern of the water heritage in the cultural World Heritage. Although these types cover most of the types of water heritage in the world, there are still some infrastructure types missing, such as water purification and measurement (e.g. the Nilometer in Nile River, Cairo). As the number of infrastructure types

(31 types) is relatively large for the quantity of identified sites (144, population), it is hence more appropriate to sort the population by functions. Figure 5-1 (right) presents a statistical pattern sorted by main functions, which reveals how water heritage associates with people's life in the past.

Water supply (which encompasses the three biggest functions of water distribution, storage and harvesting) was of much higher demand than discharge (i.e. drainage), at 51 per cent compared with 6 per cent. It demonstrates that access of water was the most crucial demand and issue for ancestors. Conversely, it reveals that the discharge of excess or wastewater was of lower necessity. This could infer that, in the past, excess water from domestic use or rainfall had a greater chance of being recycled either by infiltration into the soil or evaporation in the air, due to a less built environment. On the other hand, the wastewater could also be purified by natural processes within the environment; even if it takes more space and time. This was likely because of the conditions of the environment, as well as the different concepts of hygiene by the people at the time. As for the traffic, it was an essential function in the past, no matter whether it was using water for transportation or structures for crossing water. We can therefore understand that the demand for water-related traffic historically was higher than in modern times, which is evidenced by the revolution of transportation in history. It also reveals the fact that a considerable section of water traffic exists where the distribution or discharge of water functions happen.

The pattern of water heritage of WH helps understand the role it plays in the world, which implies the actual proportion of water heritage in cultural heritage in the world is supposed to be higher due to being overlooked in the practice so far. Moreover, the quantity of certain types of functions may be particularly undervalued due to not being listed as World Heritage. Since World Heritage requires a very high standard with OUV, as well as in authenticity and integrity that is directly involved with the status of conservation. Besides, becoming a World Heritage is generally based on the perspective of a 'tangible heritage property'. The World Heritage Convention strengthened the identification of its cultural heritage as tangible heritage since it limits its scope to immovable cultural property. Therefore, it implies that there are still lots of tangible and intangible water heritages with significant cultural value not listed in WH system, particular in agricultural heritage, aquaculture heritage, and underwater heritage (the last is included in the Cultural Landscape of the right Figure 5-1). Furthermore, as cultural heritage is still building up, as time goes on, some portions will increase as newer heritage sites

are inscribed in the future (e.g. Hydraulic Application); some new portions will be added (e.g. Water Purification).

5.3.2 Water Heritage in International Heritage Conservation Systems

As section 5.3.1 investigates water heritage in WH that focuses on tangible aspect, in order to know how water heritage relates to intangible sphere, and to know how water heritage features possessing more inclusive dimensions, it is of merit to see how international systems/programs work in respect of heritage conservation. By illustrating the current international heritage programs with different dimensions (Figure 5-2), something interesting can be seen. Firstly, water-related heritage is apparently the only category to be selected as a scope of conservation system, namely GIAHS, UCH, HIS, and WHS, revealing its importance regarding heritage conservation. However, the importance recognised seems to primarily exist out of UNESCO's systems of which the practices are dominating global practices. Secondly, water heritage exists in all the systems, covering natural and cultural, tangible and intangible sphere. This figure also reveals there can be certain types of water heritages with significant value but not easily selected as World Heritage, such as the category of agriculture, aquaculture, and cultural landscape (e.g. underwater) with reference to Figure 5-1, which is the main reason why these water-related heritage programs (i.e. GIAHS, UCH, HIS, and WHS) are established, reflecting the high urgent demand of protecting water-related heritage due to the constraints from the criteria of World Heritage, or more precisely, from the authorised values. We hence realised that water heritage is particularly overlooked in UNESCO's systems, whilst the systems are exactly the more influential one, which leads to the overlooking of water heritage in global practice. Notwithstanding GIAHS dedicates to advocate a more community-based and bottom-up idea underlining intangible sphere, and represents a discourse opposed to AHD, which is valued for its local or regional significance and is often associated with indigenous and other traditional peoples through water-related heritage (i.e. agriculture) (Howard, Puri, & Smith, 2009), this remarkable system still lacks of attention and therefore cannot significantly make global practitioners to rethink the idea of heritage in response to the dominating discourse in the global practice, e.g. the AHD with respect to World Heritage system. It reflects a fact that, although water heritage of GIAHS, HIS, and WHS has better potential to tackle issues between nature and culture, tangible and intangible, foreground (i.e. fabric) and context (i.e. social-ecological), and diverse stakeholders that cause adverse interventions to the sustainability of heritage, it is still very challenging for these systems to draw attention from state parties,

without a ‘world’ title. It reveals the competitive phenomenon existing between international systems. In addition, it is a pity that these three systems merely benefit the understanding and protection to agricultural heritage; there are still many types of water heritage that are in need of this support. This section reflects that water heritage and its viewpoint can better help reframe the idea of intervention, as well as help rethink the idea of heritage conservation.

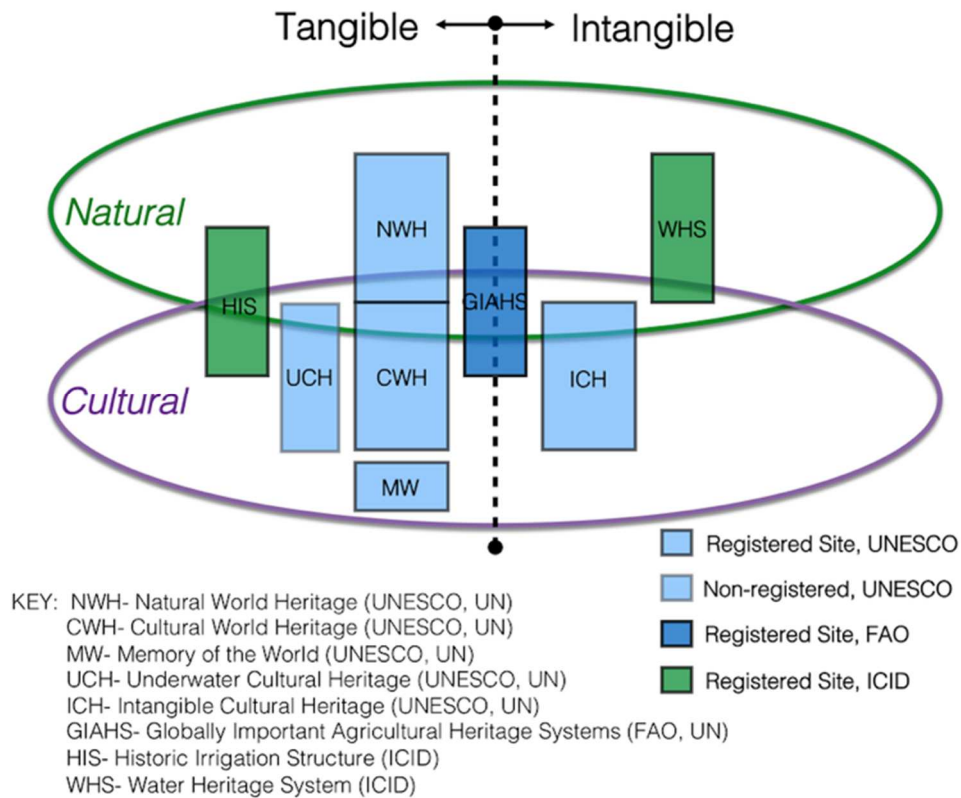


Figure 5-2. Integrated international heritage conservation conventions or programs (based on Tyagi and Yamaoka (Willems & van Schaik, 2017)).

5.4 Development of a New Intervention Perspective

5.4.1 Intervention on Water Heritage

As mentioned earlier, the main purpose of this chapter is to develop a new perspective of intervention with assistance from water heritage viewpoint. In order to elucidate that heritage is not the only object/target to be conserved, the study first addresses the importance of another two objects/targets, the context (i.e. setting) and the natural environment (of heritage), through the discussion of three water heritage cases. It should be noted that the case study does not aim

to make judgement towards their interventions.

5.4.1.1 Case 1—The Roman Baths (WH site)

The Roman Baths complex is in the English city of Bath and is famous for the mineral-rich and healing hot springs that is considered as the only ‘hot’ springs in the UK. Built by the Romans around 300 CE, the bathhouse is a well-preserved Roman site. However, the emergence of a pathogenic amoeba in the hot spring in 1977 led to the death of a child and the closing of the Roman Baths. Since the hot springs source is right beneath the Roman period reservoir, any engineering measure must be very careful not to damage the heritage above. Besides, as the hot springs plays a crucial role both to the city and the Roman Baths, any intervention on the water environment must meet the goal of sustainability. As a remedial response to this disaster, Bath City Council in 1983 drilled an inclined borehole from the Stall Street outside the Roman Baths underneath the Roman reservoir to tap the amoeba-free thermal water before its arrival at the surface area where oxidized water sustains the growth of *Naegleria fowleri* (Figure 5-3). This intervention has successfully supplied biologically clean thermal water to the drinking fountain of the Roman Baths and to a modern spa nearby (Kellaway, 1991). It is notable that the measure sought to satisfy the principle of minimal intervention, not only on the heritage (i.e. the Roman Baths), but also the water environment; the overall mediation process is removable and reversible and has not caused any damage or change to the hot springs source and its mechanism. It reveals the fact that heritage value from the water environment is no less than that from the heritage, and that these two parts are inseparable in terms of heritage ensemble. Also notably, notwithstanding the current measure of inclined borehole method cannot lead to the utilisation status of hot springs in the pools of the Roman Baths, which are still supplied with the amoeba-contaminated hot springs from the Roman reservoir (i.e. the King’s Bath in Figure 5-3a), the reversible measure highlights the significance of sustainability and resilience particularly with respect to water environment, as well as the city and its people, as the hot springs is not only a very important resource but also the identity of Bath city. The existence of the superior hot springs is essential to the city and its people and relies on the sustainability and resilience of the resource, which also reflects the significance of the hot springs value towards the city and its people (i.e. context, in terms of heritage). In other words, although the restoration of utilisation of hot springs in the pools can benefit heritage value, the sustainability and resilience of the water environment also need to be considered with heritage value aspect altogether, which leads to the decision of the

reversible measure that can only supply a small amount of clean hot springs (e.g. to the drinking fountain). Moreover, as the whole city is a World Heritage site, the measure also avoids visible variation to the surrounding landscape (i.e. setting), except for a few tiles of the street.

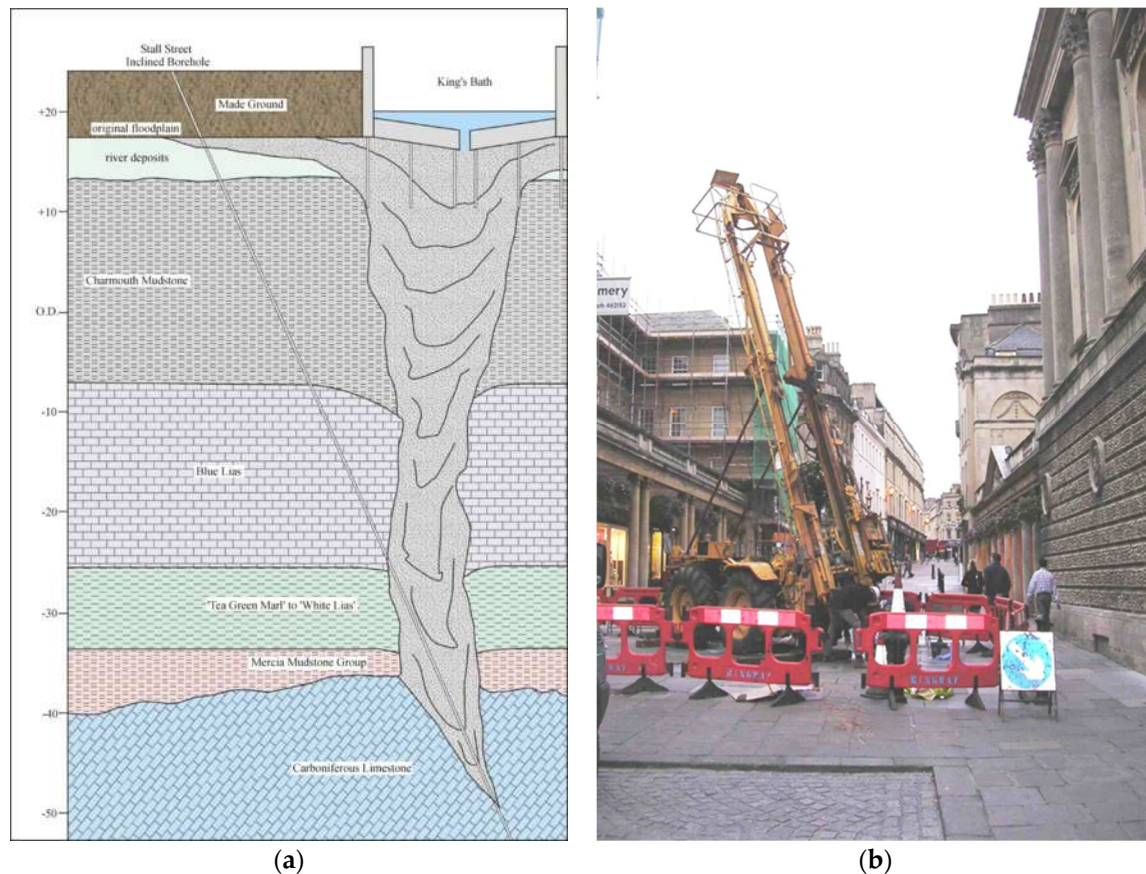


Figure 5-3. (a) Section view of the inclined borehole. Source: Wikimedia ‘The Roman Baths’; (b) The construction of the inclined borehole from the Stall Street. Source: Wikimedia ‘The Roman Baths’. Legend: To avoid adverse intervention on the heritage and its water resource, the inclined borehole was constructed from the Stall Street outside the Roman Baths underneath the Roman reservoir to tap the amoeba-free thermal water (not for the primary supplement of hot spring water in the Roman Baths). During the construction, the risk of damage of the Roman reservoir due to construction risk presents a necessary concern towards heritage in terms of intervention.

5.4.1.2 Case 2—Dujiangyan Irrigation System (DIS, WH site)

Dujiangyan is a living non-dam and multi-functional irrigation structure located in Minjiang River in Sichuan province of China, which was built in 256 BCE and is known as one of ‘The three greatest hydraulic heritages in China’ (Figures 5-4 to 5-6). Scientists and engineers

around the world admire it for its ingenious design that conforms to the natural laws of water flow and utilises the natural topography to control the flow and distribution of water. This is an ingenious application of hydraulics rather than intending to barricade or resist water force by artefact for harvesting water. The system has turned a seasonal drought area (the Chengdu plain, Sichuan) into the most productive agricultural area in China, and also dramatically mitigated the frequent phenomenon of flooding in the downstream area. However, based on the future demands for utilising water resource, hydropower and flood control, two controversial ‘sister dams’ were built in the setting of the heritage in the last two decades: the Zipingpu (in 2005) and the Yangliuhu (in 2011) projects. The Zipingpu dam (with power plant) was built upstream of DIS, but the power plant never became operational because of the risk of damaging the heritage. In order to bring the power plant on stream, the Yangliuhu reservoir was then constructed downstream between the Zipingpu dam and DIS, which intends to reduce the powerful flow of discharged water from the Zipingpu towards the heritage (Cao, Liu, & Er, 2010; Peng, 2008). This is a good example showing how a water heritage faces inevitable interventions due to the demands of the present and future generations. Although the two projects did not directly intrude on the heritage structure, they did change its water environment of which the natural mechanism of water distribution has been diminished, which means the value of the water heritage ensemble is affected. Moreover, this case also implies the fact that the surrounding landscape (i.e. setting) is impacted and conflicted by the modern mega structures.

The case also reveals there usually exist different views of intervention on heritage between environmental protection and heritage conservation. Regardless of all judgments as to whether these two infrastructures should have been built, both the project proposer and heritage society did try to influence the decision from their perspectives of protecting the heritage. The project proposer had implemented EIA, which considered that the infrastructure would also offer protection because it would completely control the river water, reducing the damage from flooding upstream in summer and from extreme climates. However, the heritage society thought differently, and contended that keeping the flow of the river in its original and natural condition is the way to protect the heritage value, as it can function naturally with its ancient designed hydraulic mechanism that applies the principles of the natural environment and physics that control flow change responses, as seen in river photography (Daily, 2003). It is deemed as the wisdom of harmony and sustainability of ancient Chinese that the heritage keeps demonstrate through generations.

Another debate is the building of the modern water gates at the outer stream of fish mouth levee (Figure 5-5) to replace the traditional levee (Figure 5-6b), which was claimed to increase operability and sustainability, from the viewpoint of modern sustainable infrastructure. However, it has led to the end of the tradition of operation and maintenance, as well as the extinguishment of heritage community. The mission of settling and maintaining the destructible levee had been the duty and part of life of local community passed through generations for two thousand years. The principles of operating and maintaining the whole system have also been composed into folk songs, practiced in traditional local festival in every year, so that the wisdom and technique can always pass down through generations. This living heritage has been terminated by the modern concrete sluice gate, and the task of maintenance and operation has been handed over to the staffs of the infrastructure authority. It is notable that the intervention of modern management has led to a destructive effect to the sustainability of local community, as well as the intangible heritage—the wisdom of harmony in managing water—what local people considered as the thing worthy of their protection and passing down through generations, rather than any physical part of the system. This is an example showing what was considered more important by the ancient Chinese in inheritance is noticeably different with what is considered by the practitioners of modern heritage conservation, not to mention in terms of intervention; the value and sustainability of community and intangible heritage are prone to be overlooked. In addition, the forms of folk songs and festival practice reflect the concept of resilience residing in the inheritance of wisdom in the past, in response to this ever-changing world and environment.



Figure 5-5. Dujiangyan Irrigation System. Source: Wikimedia ‘Dujiangyan’. Legend: The built levee (the right end of the island) divides the water into inner and outer streams. The inner stream (downside) is deep and narrow, while the outer stream (upside) is relatively shallow but wide. This special combination of the two kinds of section of the river ensures the natural mechanism of water distribution that the inner stream naturally carries more flow into the irrigation system during dry season. Whilst during flood, outer stream carries more to protect the people from flooding. The built modern water gates (upper side of fish mouth levee) replaces the traditional levee (as shown in Figure 5-6 (b)), which increases operability whilst it brings the tradition of maintenance and operation to an end.



Figure 5-6. (a) Fish mouth levee. Source: Author; (b) Traditional levee. Source: Author. Legend: The flow in front of the levee shows the natural distribution of water (Left). Traditional levee (right) made of long sausage-shaped baskets of woven bamboo filled with stones known as *Zhulong*, held in place by wooden tripods known as *Macha*, to reduce the amount of water of the outer stream in non-flooding circumstance, for assisting the water distribution of fish mouth levee, whilst it is destructible during flood.

5.4.1.3 Case 3—Yueya Spring

Located along the Silk Road in the Gobi Desert of China, the natural crescent-shaped lake oasis of Yueya Spring has existed for 2,000 years (Figure 5-7). During the Tang (c.618-936 CE), more than 100 temples and pavilions were constructed along the Road. The oasis site is a natural phenomenon combined with built heritage of great cultural value, which makes it registered in the Global Geoparks Network by UNESCO. Water infiltrating from the Dang River recharges the aquifer of the spring lake naturally. However, the damming of the river in 1975 led to a dry downstream and limited recharge to the aquifer in the 1990s (Ding & Gong, 2004; Jiao, 2010), causing the drying of Yueya Spring. To mitigate the situation, an underground infiltration facility was constructed in 2008, which uses pumped groundwater of other aquifer to recharge the spring aquifer and reverses the trend of drying. However, although the intervention of the artificial recharge does not have adverse impact on the built heritage and the landscape (i.e. setting), the change of the natural spring mechanism, namely an artificial spring, diminishes the authenticity and value of the heritage site ensemble. It is also notable that the impact of the damming intervention towards the heritage had never been

perceived and assessed by the EIA implemented.

During the past two thousand years, the architectures of the site have experienced repairs and restorations for many times, which does not affect heritage value, as what really perpetuates this site, behind the significance of the role it played on the Silk road trade, is the ever-lasting springs. Certainly, the ever-lasting springs is the value and identity of the local people; more importantly, it is of significant value to all the travellers, Chinese and foreigners, as the springs represents an ever-lasting hope for survival in the desert. However, the inadequacy of EIA to assess the impacts towards the water heritage has turned a living heritage into a dead one, at least from the perspective of travellers. It reveals that how the context of heritage, i.e. the travellers in this case, can notably affected by interventions, and that even the sustainability of the water in the lake is saved, the resilience of springs nature—the recovery both to the original and natural status of springs, and to the original meaning to travellers—has lost.



Figure 5-7. Yueya Spring. Source: Author. Legend: An underground constructed infiltration facility from pumped water for recharging the spring aquifer (underneath the lake) has reversed the trend of drying in 2008. The current spring is no longer the natural one that had lasted for two thousand years.

5.4.1.4 Summary—Water Heritage Can Help Develop a New Intervention Perspective

From the discussions in the section 5.3 and 5.4.1, the findings regarding water heritage and its

relevant interventions provide us with further understandings towards cultural heritage, as well as the challenges of the current idea of intervention, summarised as follows:

- I. Although water heritage is generally not applied as a category in heritage practice, it covers wide types from architecture, monument, and civil engineering infrastructure to cultural landscape, which makes water heritage a competent and representative role in developing approaches and theories in heritage conservation.
- II. A very strong bond between water heritage and nature environment can be seen from the classification and the case study, which demonstrates human societies of different generations always need it such that the interventions are often inevitable in order to adapt to the changing environment and demands. It also manifests water heritage is prone to become living heritage that features tangible and intangible heritage elements, as well as societal dimension. Therefore, water heritage reflects the inapplicability and challenge of the current minimal intervention theory that centres on authenticity principle exclusively for the fabric of heritage.
- III. Most of the water heritage in the classification sees a common circumstance in practice that the management authority of the water heritage is not a heritage authority. It manifests the vulnerability of water heritage with respect to heritage conservation; it also addresses the complexity and diversity of involved stakeholders, including owner, users (i.e. community, the public) and governors, so that it makes water heritage an appropriate role to address the issues of community engagement and social sphere, with a more bottom-up viewpoint. It also implies water heritage can facilitate the development of accessible and inclusive decision-making support tools, particularly for interest groups with different backgrounds in dealing with environmental management involving cultural heritage and nature. (developed in Chapter 7).
- IV. Whether water heritage can survive or retain living largely relies on the condition of natural environment, and whether water heritage can maintain its value also relies on nature, whilst usually these relationships are overlooked both from the viewpoint of environmental protection and of heritage conservation. For instance, from EIA's viewpoint, the change of water quality or quantity of a river or aquifer may not be considered or even perceived associated with the sustainability or value of a heritage, as shown in the case of Yueya Spring, which means it is not ideal to separate nature aspect from cultural heritage and leave nature aspect to

environmental protection domain (i.e. EIA). In addition, from the case of the Roman Baths and Yueya Spring, it reveals that even though the intervention is seemingly merely on water environment, the heritage, context and natural environment are all involved in terms of intervention. As the context and nature are still overlooked in the current idea of intervention theory (and HIA), a more inclusive perspective is therefore necessary—considering heritage, nature and context simultaneously in terms of intervention in order to achieve a real comprehensive and harmonious environmental management.

- V. From the three water heritage cases, we understand what really affected by the intervention is usually not the heritage value of the fabric, rather, the heritage value from its nature environment. Moreover, what also affected by interventions apart from value, are noticeably twofold—sustainability and resilience, in heritage, context and nature, which echoes the findings of harmony concept of ancient Chinese in the last chapter.

5.4.2 A Matrix Perspective of Intervention

5.4.2.1 Inclusive Appraisal of Three Objects—Heritage, Context and Nature

Through the discussions in section 5.2, one can understand that the current idea of intervention is rather narrow and only applicable to the fabric of heritage. Despite the later development of idea of setting in Xi'an declaration that is deemed more inclusive, the author argues that it is the focus on physical world, i.e. the fabric and the aesthetic harmony between the fabric and surroundings (i.e. 'setting' in practice), which impedes the improvement of intervention theory, such that the theory cannot catch up with the progress of heritage conservation that currently highlights the importance of people, nature, and social significance. Through the discussions of the three water heritage cases, they manifest that interventions are usually inevitable, and usually happen not only on heritage, but also on its context and natural environment. Although many practitioners think the intervention and impact on natural environment should be considered by environmental protection domain, the Yueya Spring case shows its inadequacy and suggests the intervention on nature should also be considered along with heritage and context, and particularly from the lens of heritage conservation.

Very often, even if only the water environment is intervened, the overall value of the water heritage will still be affected. In practice, to fulfil the current principle of minimal

intervention and authenticity, it is very often that the intervention on the water environment is preferred and compromised so as to avoid change on the fabric of heritage, e.g. architecture part, as shown in the three cases. However, as addressed in the case of DIS and Yueya Spring, although the applied interventions were merely on the water environments and have only affected the original mechanism of water environment, the value of the heritage ensemble has still been considered affected.

The dominant values-based approach has a tendency of only considering and identifying the ‘direct’ values of heritage and community. It ignores indirect value and butterfly effect in terms of intervention. However, heritage community often regards the value of nature as part of the value of heritage, even in the non-water heritage cases that nature and heritage are seemingly not linked. For instance, the Angkor heritage in the case study of Chapter 6, the loss of the value of natural environment has made the heritage community consider the heritage value has consequently been deteriorated, albeit that the value of the architecture heritage may be regarded unchanged from the lens of outsiders. Therefore, it also manifests the necessity and advantage of replacing ‘nature’ back to the idea of intervention.

Another water heritage example can manifest how tangible heritage, intangible heritage and natural environment are all interdependent and indispensable in terms of intervention and heritage conservation. Stepwell, a unique type of water infrastructure created for the conditions of local climate and water resource, can be traced back more than six hundred years in India (Figure 5-8). The water heritage functions as a reservoir for local people and is also a significant religious and social place. Local communities live in the setting of the heritage and play an indispensable role in the value of the intangible heritage by preserving traditional religious rites and social activities. The survival of the rites, the built heritage and even the living conditions of the community all rely on the existence of water resource. However, the water resources are disappearing in many of the stepwells due to the over-exploitation of groundwater in many areas, leading to the drying of stepwell, the abandonment of the heritage and the migration of local people in many cases. It shows that the natural environment, heritage and the context (i.e. community) are inseparable and indispensable in terms of intervention and heritage conservation. It also reveals that intangible heritage of local community can also be protected if the intervention theory includes nature and context as the conservation object, along with heritage.



Figure 5-8. Stepwell. Source: Wikimedia 'Stepwell'. Legend: Depleted water tables from unregulated exploitation of groundwater have caused many of the wells to dry up. Even in currently active temple wells, lack of attention has caused the occupation of garbage and plant, leading to abandonment.

Therefore, heritage, context and nature are interconnected and should not be separated, in order to achieve adequate understanding and protection towards heritage ensemble with respect to intervention. The author hence proposes a new perspective of intervention with three objects of consideration, namely heritage, context, and nature (Figure 5-9). Instead of using 'setting' as an object used elsewhere in global practice, the author suggests that using 'context' can better underline something opposite to the focus of foreground (i.e. heritage). More importantly, it can help perceive and accommodate changes and impacts in the social, cultural, and economical sphere of heritage associated community, built environment and landscape, rather than over-emphasising on aesthetic harmony only, so as to inclusively cover the diverse values of people and nature with a more bottom-up way, as well as to provide better dialog between these dimensions that are essential to cultural heritage (Harrison, 2015).

Furthermore, the significance of context with respect to the judgement of heritage value and authenticity is noted by Larsen, which elucidates that context is indispensable even under the methodological framework of the values-based theory, as can be seen from Yueya Spring case study that points out the special heritage value deemed by the travellers.

It is thus not possible to base judgments of values and authenticity within fixed criteria. On the contrary, the respect due to all cultures requires that heritage properties must be considered and judged within the cultural contexts to which they belong. (Larsen, 1994)

To accommodate changes in harmonious heritage environmental management, Avrami et al. pointed out that context does play a key role, as context itself represents the most mutable part of heritage ensemble.

Conservation has come to be seen as “a complex and continual process that involves determinations about what constitutes heritage, how it is used, cared for, interpreted, and so on, by whom and for whom. It has also become evident that decisions about what to conserve and how to conserve are largely defined by cultural contexts, societal trends, political and economic forces—which themselves continue to change”. (Avrami et al., 2008)

Ureche-Trifu argues context must be taken into consideration as ‘minimal’ intervention is a relative concept. In particular, when the object of conservation being extended encompassing heritage, context and nature, minimal intervention becomes even more unlikely to be found and defined and is no longer adequate for guiding decision-making, rather, harmony is the way to make judgement and decision. As impact is unavoidable, harmonious impact implies ‘minimal impact’ of heritage ensemble, which is the perspective to replace minimal intervention. In other words, minimal impact of harmonious intervention is the better perspective to pursue, under the extended object of conservation encompassing the three targets as ensemble, whilst the intervention on any of the three is not necessarily minimal.

Minimal intervention is a relative concept. Just as the Nara Document states that authenticity needs to take into consideration the site’s broader cultural context, the same is true when discussing minimal intervention. (Ureche-Trifu, 2013)

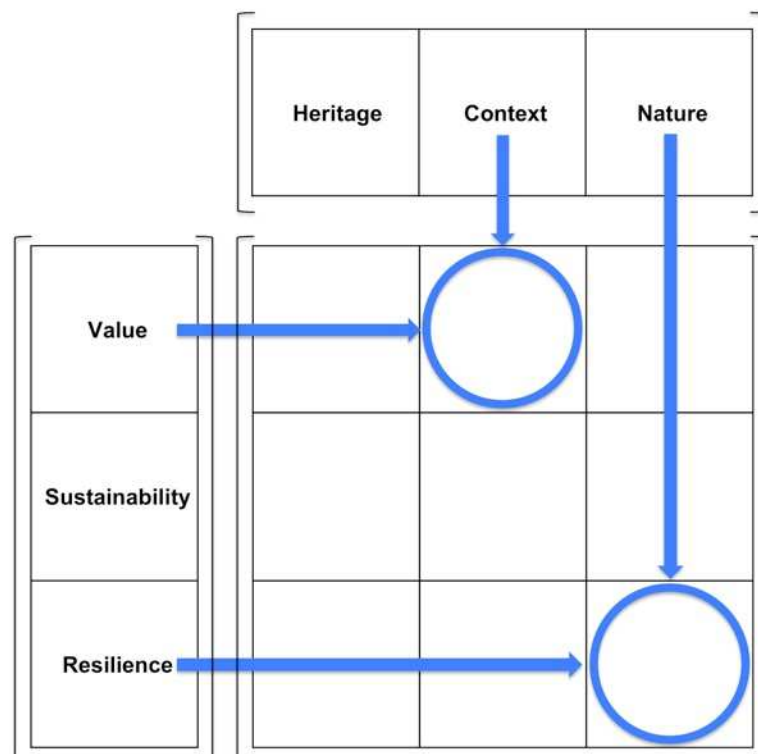


Figure 5-9. Matrix of the idea of intervention.

5.4.2.2 Comprehensive Consideration Extending Single Value Aspect to Value, Sustainability and Resilience Aspect

The last section has developed the first dimension of the matrix approach in intervention, which is a dimension with the three conservation objects to achieve the minimal and harmonious impacts. The second dimension of the matrix is subsequently developed in this section.

Since the current intervention theory is based on the values-based theory and therefore assesses the intervention on value aspect only, the author argues that not only extending the conservation object from the physical elements of heritage to the three objects is necessary, but also assessing intervention with merely value aspect is inadequate. In other words, to find other critical aspects missing in terms of the assessment of intervention is the purpose of this section. As most of heritage practitioners recognise that the purpose of heritage conservation is to protect the value of heritage, and that the object to be protected should contain more than merely the fabric, which has led to the evolution of heritage conservation from material-based approach to the values-based approach, and a better inclusion of intangible sphere. Notwithstanding using value aspect is necessary in conservation as it facilitates practitioners to

comprehensively understand and identify the values of heritage so as to protect the values, the author argues that using the ultimate target—protecting heritage value—as the only criterion for assessing intervention is prone to ignore something crucial in the process, such that comprehensive considerations cannot be achieved. As noted by Rokeach to describe values, values have the attribute of ‘end state’. Therefore, the current intervention approach has caused the concern of using end goal as the criterion of a management approach, which seems lack of effectiveness with respect to assessment process.

Values are defined as prescriptive beliefs about end states of existence (e.g., peace) and modes of conduct (e.g., justice) that transcend specific objects and situations and that are held to be personally and socially preferable to opposite end states of existence (e.g., war) and modes of conduct (e.g., injustice). (Rokeach, 1973)

Therefore, from the water heritage case studies, the following situations and problems are identified and summarised to illustrate the inadequacy and shortcomings of the minimum intervention that uses value as the only assessment aspect, so as to find out the neglected crucial aspects—sustainability and resilience.

I. Contemporarily-perceived and ever-changing character of values

Value is a contemporary perception and may change over time. The water heritage Pont du Gard is an example (Gard, southern France, Figure 5-10), initially recognised by the World Heritage Convention as an outstanding Roman monumental architecture, but in a relatively late stage recognised the Outstanding Universal Value (OUV) as a Roman aqueduct. It means, as for temporal dimension, value aspect resides in the perception of the value of the present. As Smith (2006) noted that the value of cultural heritage is considered extrinsic rather than intrinsic and considered attributed by a group of people with values of a given time, which naturally cannot represent the value of the future. Tunbridge and Ashworth (1996) also noted that ‘the present selects an inheritance from an imagined past for current use and decides what should be passed on to an imagined future’. Consequently, the value aspect of the current intervention approach has limited the consideration regarding impact of the future.



Figure 5-10. Pont du Gard, World Heritage. Source: Wikimedia ‘Pont du Grad’. Legend: Its recognised Outstanding Universal Value was shifted from a Roman monumental architecture to a Roman aqueduct.

Likewise, different generations often have even more different views towards culture and heritage; the decisions the present generation makes may not be completely right or appropriate for future generations. Only protecting the values currently identified through the assessment of intervention implies that undiscovered or unidentified values may consequently lost. Also, not just heritage values may be lost. The building of the modern water gates for replacing the traditional levee of DIS reveals that some interventions can affect the sustainability of community and intangible heritage (i.e. traditional techniques of operation and maintenance). Another example can be seen in Yueya Spring, the building of the dam has sacrificed the resilience of the value and meaning of the ever-lasting springs towards travellers, even if the future generations prefer not to have the dam. Therefore, sustainability and resilience are the key aspects to accommodate changes with respect to temporal dimension, in order to redeem the value aspect of the current intervention approach.

II. Neglect of the (dynamic) condition of associated carriers

The values-based minimal intervention approach has the tendency of focusing on the values of heritage entity, leading to the neglect of the ‘condition’ of the associated carriers—people and nature. Moreover, the impact itself can also change over time due to the dynamism of society, i.e. the ever-changing context. The stepwell case illustrates the drying situation leads to the migration of local community that used to practice religious ritual and maintenance skills on site. In many cases, even if the over-exploitation of groundwater has been eliminated and the

water is hence filled again, the left community would seldom go back, along with the intangible heritage. This example reveals two things. On one hand, the value of intangible heritage is prone to be overlooked in this regard; on the other hand, the socioeconomic condition of community is ever-changing, such that the loss of sustainability, resilience and even value may not recover even after the intervention is gone. In other words, unlike tangible heritage that the loss of value is usually caused by the change of physical status, the value of intangible heritage is generally less likely to be directly affected, whilst what may be affected are the carriers of the intangible heritage, including the ability to meet the demands of the present, the chance to sustain the heritage and the ability to pass the heritage to future generations, all of which reside in the 'condition' of the community, e.g. socioeconomic one. Likewise, changes in the condition of natural environment could have adverse effect to heritage ensemble, which is like changes in the socioeconomic condition of the community. As the example of DIS, it is usually water resource authority who conducts the operation and management of dam infrastructure nowadays, rather than local community as the way in the past. Therefore, the changed condition of water environment is also prone to be overlooked such that interventions adversely affect the sustainability and resilience of heritage ensemble.

III. Tendency of authorised sectionalism

The minimal intervention approach based on assessing the changes of value has caused concern regarding the tendency of authorised sectionalism. The Pont du Gard is an example (Gard, southern France), the changed Outstanding Universal Value (OUV) of World Heritage Convention portrays how heritage values are generally identified and decided by authority rather than by community or even someone who is not an expert. Smith (2006) points out this issue is main part of AHD, which happens usually when value collaborate with power. She further noted that,

Heritage is exclusionary and it is intentionally so. The social inclusion agendas concerned with making heritage more inclusive..., simply miss the point, particularly when such concerns are framed in the context of education and social improvement coupled with an uncritical examination of the definition of heritage. In effect, much of the social inclusion policies and practices are little more than assimilationist and designed to iron out and de-legitimize cultural diversity. (Smith, 2009)

Therefore, value is considered as a top-down, authority-based perception, using value as the only aspect in intervention assessment may result in the value of minorities or of cultures that

are not officially recognised being overlooked and sacrificed. However, this situation can be improved by introducing sustainability as an additional aspect because sustainability underlines less competition and sectionalism and facilitates the consideration of cultural diversity that the value aspect can hardly achieve substantially.

IV. Lack of consideration in risk and uncertainty

The values-based view in intervention also lacks consideration in risk management and does not protect against disasters in which heritage or community would suffer catastrophic or complete devastation. Since heritage is something that people do not want to lose due to its irreproducibility, the sense and idea of risk in heritage management is supposed to be of high level. However, as pointed out by World Heritage centre (Jigyasu et al., 2013), despite the increasing vulnerability of cultural heritage to hazards, disaster risk reduction does not register as a priority area for management of World Heritage properties. The value aspect has limited the consideration of risk/probability dimension due to its certainty attribute, which, in other words, has a tendency of merely concerning the impacts that is predicted to happen with very high possibility (i.e. nearly certain). It means low risks but with destructive effect will usually be overlooked in the current idea of intervention, whilst it is vital to the survival of heritage. For instance, in the DIS case, the building of the two reservoir may not cause adverse effect on heritage values, whilst what has been created is the risk of destructive damage to heritage, which may be due to extreme flood caused by the failure of the dam upstream, or an intentional emergency discharge of the reservoir (Magee 2014). It reflects that even if only the water environment is intervened, the resilience of heritage and of context may also be affected. Therefore, the author suggests adding ‘resilience’ aspect as the third aspect to represent the consideration in risk dimension in terms of intervention. The resilience aspect also highlights the ability of recovering from destruction or adverse impacts, which is not only applied for physical heritage, but also for community, intangible heritage and social sphere that are usually prone to be neglected.

V. Neglect of indirect and cumulative impact

The introduction of sustainability and resilience into intervention assessment also makes it easier and more practicable to assess the adverse effects indirectly caused by the interaction between multiple factors, such as the interaction between human force (e.g. developments) and natural force (e.g. climate change), as the values-based minimal intervention has the tendency

of considering direct effect on heritage values from intervention. For instance, the over-exploitation of groundwater reduces the sustainability of water environment in stepwell; it will get worse particularly when adverse climate change happens. Similarly in DIS case, the building of dam upstream reduces the resilience of DIS and the community; it gets worse particularly after the destructive Wenchuan earthquake happened in the area in 2008 and has hence raised a considerable concern towards the safety of the dam (Chen, 2009; Houqun, 2008; Zhang et al., 2018). It is notable that in these two cases, heritage value seems unaffected, whilst it is sustainability and resilience that are affected by these indirect or cumulative effects.

VI. Dissonant effects between heritage, context and nature

Inevitably, intervention may sometimes cause different effects to different kind of heritage values, or different effects towards heritage, context and nature. As Taylor and Cassar (2008) noted, ‘ways to preserve individual values are often in conflict with each other. Inevitably, conservation interventions, however subtle, can cause the loss of some kinds of value in order to preserve others’. For instance, in the case of the Roman Baths, there may be other engineering methods that can simultaneously tackle the issue of contaminated hot springs and provide a large amount of hot springs for utilisation in the heritage pools rather than the current minute one, so that the value with respect to tourism is higher, whilst those methods will increase the risk of collapse of the Roman reservoir (i.e. the outlet of the hot spring), which means the decrease of resilience to heritage, context and water environment. Another case can be seen in Yueya Spring, notwithstanding the building of dam can effectively achieve better utilisation and value of the water resource from nearby river, the drying result of the springs still causes the loss of heritage values.

Nowadays, many industrial heritages are facing conflicts with environmental protection issues, such as mining, dyeing, and food manufacturing industry (Awuah-Nyamekye & Sarfo-Mensah, 2012; Howard, Kincey, & Carey, 2015). There are also examples of the changes of water environment causing conflicts with the conservation of heritage. The Grand Canal is an example (China, World Heritage). In order to alleviate the incidence of flooding, the change of watercourse of the Yellow River due to climate change has led to a necessary widening measure to a section of the canal (Jie, 2008). The foregoing examples also reveal that intervention should be deemed as neutral, particularly with the extended three objects, and no longer be considered as absolute adverse, which means an intervention that is disadvantageous to heritage can instead be positive to context (e.g. community) or nature, and vice versa.

Furthermore, tourism development reflects the weakness in intervention assessment in this regard due to the neglect of significance of context. The development proposers have a tendency of balancing the advantages and disadvantages with value, in particular gaining economic value as advantage in response to losing heritage value as disadvantage. However, usually the issue of the balance in value is well addressed and evaluated, whilst the sustainability and resilience aspect of heritage ensemble, in particular context and nature, are the things overlooked.

Therefore, a new perspective of intervention is proposed, as shown as Figure 5-9, which is presented as a matrix perspective with the three objects of heritage, context and nature in one dimension, and the three aspects of value, sustainability and resilience in the other. The advantage of matrix form is highlighted here, as assessing intervention through a matrix way substantially helps perceive the approach and make comprehensive considerations across these aspects and objects, rather than a passage of doctrine usually presented in international charters and guidance, which is difficult to guide the thinking of readers. Therefore, instead of sticking to the idea of ‘minimal intervention’, the author suggests a more comprehensive way—minimal impact of ‘harmonious’ intervention, with the proposal of a two-dimension matrix approach.

5.5 Conclusions

This chapter focuses on the current idea of intervention that is rather narrow and limited in conservation practice and has been considered out-dated due to the incapability to catch up with the revolution of heritage conservation of recent decades. Through a critical analysis towards the use of setting in global practice, the research manifests that sticking to the physical world, i.e. the fabric and the aesthetic harmony between the fabric and the surroundings, is the main cause that impedes the improvement of minimal intervention theory.

Followed by the exploration of water heritage, an overlooked category with diverse dimensions, through discussing the classification of water heritage, it portrays the pattern of water heritage with the typology of infrastructure and of function, and reveals some of international conservation programs endeavour to present a more inclusive, bottom-up, community-based, and anti-reified idea of heritage conservation mainly by water heritage, in response to the others programs that seem to dominate global practice with AHD. The findings also reveal, even in the World Heritage list that is deemed as of preference on architectural and monumental heritage, that there are still 24 per cent of cultural WH identified as site with

water heritage content or site with water issue. Coupled with case studies of several water heritages, it also manifests water heritage can play a great role in rethinking the idea of heritage conservation and in developing the idea of intervention.

The findings of this chapter not only provide further understanding of cultural heritage, but also furnish a new way of thinking for intervention. From water heritage case studies, the research firstly concludes the necessity of extending conservation object to heritage, context and nature, then further points out six shortcomings from the values-based minimal intervention approach: (1) Contemporarily-perceived and ever-changing character of values; (2) Neglect of the (dynamic) condition of associated carriers; (3) Tendency of authorised sectionalism; (4) Lack of consideration in risk and uncertainty; (5) Neglect of indirect and cumulative impact; and (6) Dissonant effects between heritage, context and nature. In response to the six issues, the findings point out the missing aspects—sustainability and resilience, in addition to value aspect, as the second dimension of matrix approach. The proposed approach is an inclusive perspective, highlighting minimal impact of ‘harmonious’ intervention, in a matrix form with the three objects of heritage, context and nature, and the three aspects of value, sustainability and resilience. The proposed matrix approach is expected to guide users to a new way of thinking regarding intervention and to achieve a more comprehensive consideration, which is also an underlying approach for further exploring HIA in Chapter 6 and the decision-making support of environmental management in Chapter 7.

Chapter 6 To Reshape Heritage Impact Assessment Dominated by Multiple Discourses: Analysing Statutory System and Developing a New HIA Approach

6.1 Introduction

So far, two prominent approaches can be seen in the global practice of heritage conservation. One represents heritage management practice that is made up of practice, guidance and legislation and has been constructed around fabric, authenticity and expertise, whilst the other presents as an evolving approach that recognises difference, diversity, community and significance but accepts heritage as a practice and a process that is constructed in the present (Emerick, 2014). The former is referred to by Smith (2006) as ‘the Authorized Heritage Discourse’, whilst the latter was hence developed in response to the issues of AHD and parallel discourses; the dissonance has caused widespread discussions and influence in the field, in theory and in practice as well. This is the evolution and trend of heritage conservation of these recent decades, mentioned in the literature review chapter.

However, the existing paradigm of HIA conduction seems to still fall behind this trend; and there is still no sign of improvement against AHD. It hardly follows the changing context of heritage conservation. It is still deemed by many scholars and practitioners as a discipline that is focused on preserving/freezing the past; and a discipline that has emphasised on the preservation of the fabric, and therefore has imposed a disconnection between heritage and people, and between culture and nature. As some researchers argue that the leading HIA document—*Guidance on Heritage Impact Assessment for Cultural World Heritage Properties* published by ICOMOS (2011)—has its implicit assumptions that derive from the ‘preservation’ discourse referred to the ternary classification by Ashworth (please see Chapter 2), and some researchers have criticised the inadequacy of HIA conduction based on EIA framework, plus a sub-AHD has been observed rooted in planning system (please see Chapter 2), it seems the causes of obstacle to the improvement of HIA are rather complex. The author hence argues that not only in WH practice as Patiwaël et al. point out (2018), but even worse, the global

practice of HIA has been misled by AHD, and also by other discourse as well. It is these multiple discourses that obstruct the positive evolution of HIA.

Since HIA is deemed as a powerful tool for protecting the value of heritage, as well as for achieving harmonious environmental management, this chapter hence aims to reshape the current HIA paradigm, so as to make HIA really be an advantageous tool that can follow the needs of a fast changing present, that can augment the significance of intangible sphere and community involvement, and that can address the communication and interdependence between nature and culture.

As the conduct of HIA mainly involves three aspects, namely legislation, administrative system and HIA approach, to unfold the multiple discourses, as well as to understand how the discourses affect HIA conduction of global practice, the research carries out an investigation of five representative countries towards legislation and administrative system, along with a review of development background towards Impact Assessment. Followed by tackling the third aspect—HIA approach—that has developed from the values-based perspective and minimal intervention theory, the author then proposes a new HIA approach based on the matrix perspective of intervention developed in Chapter 4, which is expected to be more comprehensive than the existing approach. Through a case study of water heritage regarding adverse impacts occurred in various respects, it further manifests the potential and adequacy of the proposed HIA approach.

6.2 Literature Review

6.2.1 Current Challenges of HIA Conduction

With the evolution of heritage conservation, along with the rising of human rights and extremely changing climate condition, there is increasing awareness on the changing context of heritage conservation, leading to a widespread influence of the emerging approach in the past two decades (Emerick, 2014). The emerging approach provides a different lens to observe, understand and conceptualise heritage. Some dimensions that was overlooked in the past have hence been given more emphasis, which include the social dimension highlighting community significance and its sustainable development, the spatial dimension featuring expanding from monument and architecture to landscape and area, the time dimension covering different time spans (i.e. regarding heritage as a social process) and intergeneration, and the environmental dimension underlining climate change, and the interdependence and interaction between

culture heritage and nature (Albert, 2015).

The overlooked dimensions present as the issues of AHD (Smith, 2006); they have also become the current challenges of the planning system that is referred to the 'sub-AHD' by Pendlebury, as reviewed in Chapter 2 (2013). However, the conduct of HIA that is usually engaged with planning system seems to exacerbate the phenomenon, as it is related to the survival of heritage rather than merely the issues of listing or registration in planning system. A common misunderstanding regarding HIA is that many practitioners and agencies assume historic assets represent cultural heritage, which implies a focus on protecting archaeology remains or historic buildings. Consequently, a single kind of professional—usually an archaeologist or conservation architect—is considered sufficient for all such heritage (Bond et al., 2004; Byrne et al., 2003; King, 2000). It reveals that the focus of HIA is still on the preservation of fabric. According to Byrne et al. (2003), the HIA paradigm has imposed a disconnection between heritage and people and can hardly enhance intangible sphere and community involvement; the notion of reification in HIA also shows a tendency of protecting cultural heritage by freezing the past, rather than embracing the idea that cultural heritage is a field of social/cultural action that features actively changing. As Byrne et al. further noted, 'the significance or meaning of heritage places is simultaneously inherited and reinvented by the living. The living, in this way, are constantly re-producing significance.'

Nature is an essential that is interdependent with heritage and its people, whilst current HIA paradigm has a tendency of ignoring it instead. The predominant EIA-based HIA paradigm seems to have little concern about nature dimension, assuming nature dimension will be fully considered and assessed by EIA. However, some reoccurring issues reveal the fact that proposed actions may have some impacts on the nature environment instead of on heritage itself, conversely causing indirect and cumulative risks towards heritage and/or community (e.g. impacts increasing the risk of landslide, flooding and fire incidents). Furthermore, another prominent issue reflects the ignorance of heritage value endowed by nature. The existing HIA paradigm, that works on the basis of statutory designation system with predomination of archaeology remains and historic architectures, has a tendency of confining itself the ability of conserving the heritage significance contributed from nature environment, for instance, the bond between nature and indigenous cultural heritage (Byrne et al., 2003), as well as the significance of nature environment towards water heritage.

The issues mentioned in the last two paragraphs reflect that the current HIA paradigm is also affected by the sub-AHD that Pendlebury has addressed in terms of the planning system.

However, there still exist differences in many respects between the paradigm of HIA and of the planning system; HIA paradigm seems to involve more complexity than the paradigm of the planning system. With the paradoxical notion that historic built environment is part of natural environment, coupled with the fact that some of the procedures and authorities are overlapping between EIA and HIA, HIA is therefore prone to be confused with, or considered as the content of EIA with merely different assessment objects. The misleading by material-based EIA practice has predominated the conduct of HIA globally, in the way of conducting HIA as part of EIA, in legislation, administrative system and HIA approach. This phenomenon seems to be another kind of ‘authorized discourse’, which is similar to the AHD to some extent. The research therefore needs to question: is this discourse part of the multiple discourses that obstruct the improvement of current HIA paradigm?

HIA is widely recognised as a powerful tool (Rodgers, 2011; Teller & Bond, 2002). It is particularly important because development has become the most prevalent threat to historic environments (Veillon & UNESCO, 2014). However, this tool is by all means a knife with two cutting edges; it could protect cultural heritage, whilst it could also result in an irretrievable loss of heritage; it could keep being a top-down tool to reinforce AHD, whilst it could also be a tool standing against the discourse. Notwithstanding HIA has been statutorily conducted in many countries for more than two decades, there are increasing concerns about the inadequacy of the existing HIA approach (Antonson et al., 2010; Bond et al., 2004; Lindblom, 2012; Masser, 2006; Teller & Bond, 2002). The existing approach is based on the values-based approach and relies merely on value aspect for carrying out assessment. However, as the values-based approach itself has reflected some issues of the AHD in heritage conservation. The author hence also argues that the existing HIA approach misses something important and is not comprehensive and inclusive in terms of consideration towards impact and recipient. A new approach therefore is needed, in addition to the improvement of statutory sphere (i.e. legislation and administrative system) in response to the multiple discourses.

6.2.2 Various IA Types

It is worth exploring the development background of HIA because it reveals some critical clues how HIA gets the current paradigm with all those issues and challenges mentioned earlier. It all started from the original usage of EIA emerged with the adoption of the US National Environmental Policy Act (NEPA) legislation of 1969 (Congress, 1969). The Act stipulates that EIA contains an element dealing with impacts on ‘cultural resources’, which shows the

way HIA is initially conducted in the form of EIA or as a section of EIA. Soon after the US NEPA, another critical legislation instrument also helped this trend to predominate globally, which is the Directive on Environmental Assessment (85/337/EEC) of European Council (Council, 1985). In the early 1980s, the existing disparities between Member States regarding environmental protection could have promoted competition and thereby affected the functioning of the single market. To prevent such disparities, the Directive was hence created (Council, 1985). It clearly establishes the principles for assessing the impact of projects on cultural heritage with the EIA framework. It also requires Member States to integrate EIA into the existing domestic statutory procedures for development consent to projects. Consequently, the Directive has led to the similarity of legislative paradigms in terms of EIA amongst European countries, meaning most of the Member States statutorily conduct HIA in the framework of EIA, under national and local legislations (Teller & Bond, 2002).

Soon after the adoption of US NEPA and the European Directive, practitioners and decision makers realised that the social consequences from specific policy action or project development can be significant and therefore should also be assessed in advance. Both legislations successively established Social Impact Assessment (SIA) as a statutory process and tool to supplement the neglected social dimension of EIA. However, SIA has not been adequately implemented in the world as a tool to deal with cultural heritage within EIA framework, as SIA is mandated and performed in conjunction with EIA but not mandatory to be implemented. It implies that EIA and even HIA both have a tendency of ignoring and even avoiding from the consideration of social dimension.

After EIA and SIA were statutorily adopted worldwide, other relevant and subsidiary forms of IA were developed, including Cultural Impact Assessment (CIA) and Heritage Impact Assessment (HIA), for specific targets and functions, as well as for the purpose of better addressing cultural dimension in IA procedure. Apparently, the development of CIA and HIA is to supplement the insufficiency of EIA in terms of cultural heritage (ICOMOS, 2011). So far CIA has been conducted primarily for appraising impacts of development on indigenous communities (Partal & Dunphy, 2016). This narrow application of CIA in indigenous heritage reveals that, to some extent, the intention of using ‘culture’ as a scope is to augment intangible sphere, as EIA that focuses on tangible sphere is inadequate to identify and protect the significance of indigenous heritage.

As CIA is supposed to be applicable to all different sources and types of culture, including tangible or intangible, conventional or contemporary, and past or living, rather than

the narrow application in indigenous cultural heritage, an increasing awareness of cultural heritage management worldwide has led to the development of HIA specifically for cultural heritage. Heritage practitioners narrowed the scope of culture to built cultural heritage when initiating HIA. Along with the requirement of integrating into statutory and administrative system, HIA has naturally been confined with designation system, which also reinforces the tendency of focusing on preserving fabric (Byrne et al., 2003). Therefore, notwithstanding HIA legislations in many countries have underlined the conservation of intangible elements and community involvement, the outcome is still far from satisfaction. The material-oriented HIA paradigm has imposed a disconnection between heritage and people, which shows no superior to its predecessor—CIA in this respect.

With the influence from US NEPA and the European Directive, CIA and HIA naturally follow the step of SIA to supplement EIA within EIA's umbrella (Rodgers, 2011). Consequently, they both follow the way EIA being implemented through the statutory planning system. So far, these IAs dealing with cultural heritage have been practiced in many countries over the past two decades, however, plenty of research criticises the performance in those countries. Common shortcomings include limited consideration of intangible aspect, little community involvement, deficiencies in methodological guidance, incapability to identify potential impact, and lack of consideration of social dimension (Bond et al., 2004; Byrne et al., 2003; Jones & Slinn, 2008; King, 2000; Teller & Bond, 2002). These issues reveal that, despite the various attempts and versions of IAs that can be applied for dealing with cultural heritage, all these IAs have formed a similar paradigm that is seemingly problematic tying to EIA. Also notably, the paradigm is rather affected by the AHD.

6.3 Unfolding the Multiple Discourses Affecting HIA Conduction

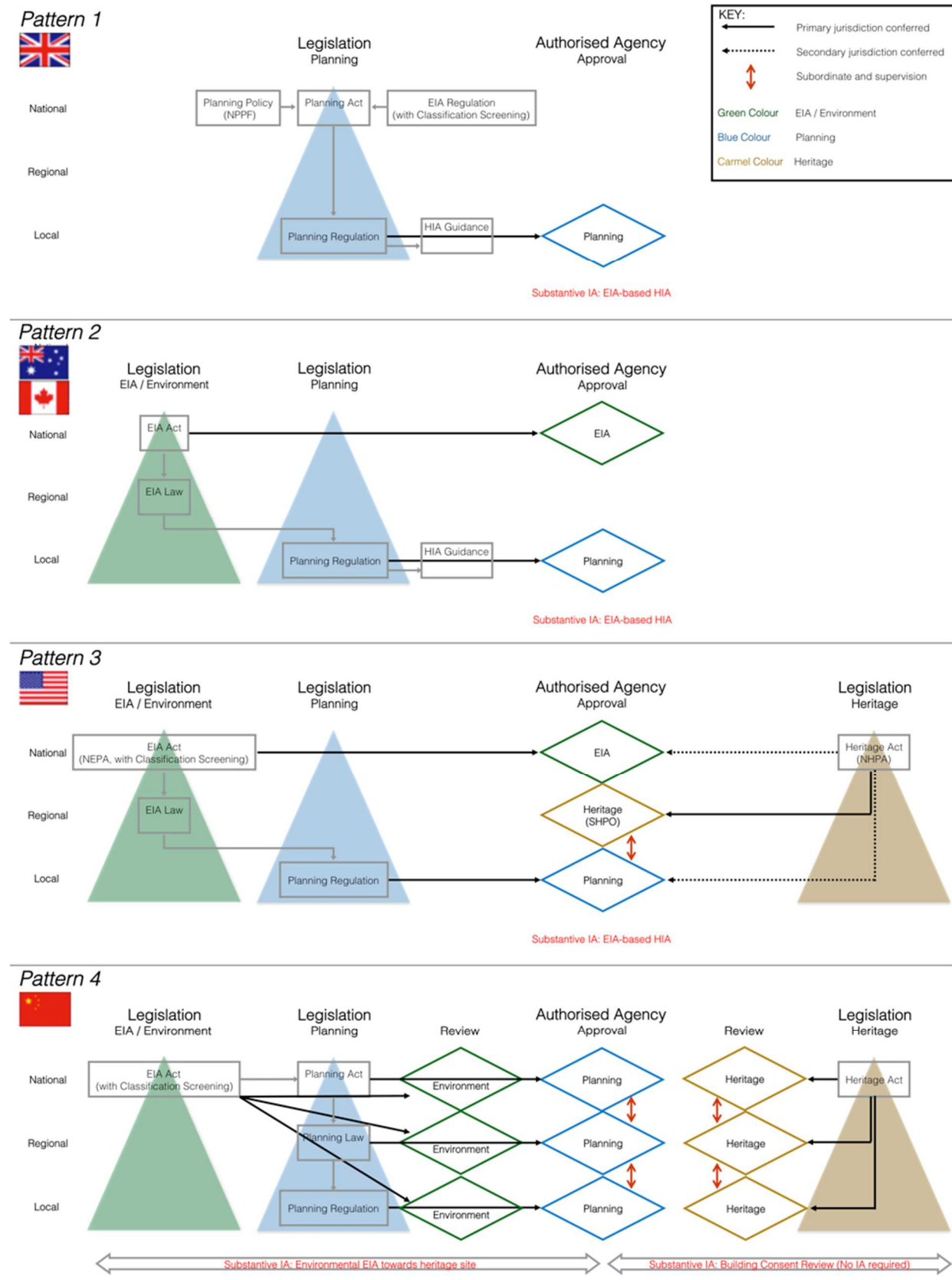
In order to unfold the multiple discourses affecting HIA conduction, as well as to understand to what extent the multiple discourses affect global practice, so as to comprehensively reshape the current HIA paradigm, the research first investigates two aspects of HIA conduction—legislation and administrative system—from five representative countries in this section, then works on the third aspect of HIA conduction, HIA approach, in the later article.

6.3.1 Exploring Statutory Patterns of HIA Conduction

The research investigates HIA statutory practices of five countries, including Australia,

Canada, China, the UK and the US, through the review of official legal instruments, research literature and government publications regarding relevant legislations and administrative system in HIA conduction, for identifying different patterns of statutory implementation. In order to identify the patterns to a better extent of representative, the research selects countries that are from different regions of the world, with considerable territory, population and cultural heritage, and to some extent substantially deal with cultural heritage by IA. In addition, the selected examples cover nation with and without indigenous heritage issues, nation at relatively developing stage of HIA and at developed stage, and nation with EIA-dominated HIA and with relatively more independent HIA. The 'HIA' phrase used in the article from this paragraph onwards represents the IAs substantially dealing with cultural heritage, including EIA, CIA, HIA, CHIA, as different countries use different terms in their system.

The author identifies four statutory patterns from the HIA conduction of the five countries, which illustrate the relationships between legislation and administrative system, by showing how HIA is conducted between different type of legislations, as well as how HIA is conducted between legislations and authorised agencies (i.e. administrative system), as shown in Figure 6-1. The legislations, represented by the triangles of green (EIA or environment), blue (planning) and camel (heritage), encompass different level of legislation instruments (rectangles), from central to local government. At the national level, examples include the federal governments of the US, Canada and Australia and the central governments of China and the UK; examples of regional level legal authorities include the state governments of the US and Australia and the provincial governments of Canada and China; City governments and councils represent local level authorities. The legislation hierarchies also illustrate the connections of legislation instruments, which shows the way HIA jurisdiction is given to a lower or derivative legislation instrument. The coloured rhombuses represent authorised agencies, which include approval agencies and subsidiary authorised agency (i.e. offering expertise and review). Arrow lines represent the main jurisdiction conferred by the sourced legislation instrument, whilst arrow dash lines represent a subsidiary jurisdiction conferred. The type of agency depends on what legislation source gives it the main jurisdiction (i.e. by arrow line), whilst it should be noted that one agency may simultaneously be conferred with a main jurisdiction and a subsidiary jurisdiction.



The patterns demonstrate the complexity of HIA conduct between legislation and administrative system. The first pattern that only has a single legislation hierarchy, as seen in the UK, is the simplest amongst the four patterns. Its characteristic and simplicity are presented in the way that the EIA legislation instrument (i.e. The Town and Country Planning (Environmental Impact Assessment) Regulations) was established pursuant to the jurisdiction conferred by the planning legislation instrument (i.e. The Town and Country Planning Act). Based on its EIA framework, as well as the influence from the compliance with the European Directive, there inevitably exist some inadequate requirements and limited considerations in HIA implementation, for instance the classification screening (discussed in 5.3.2). With the subsidiary National Planning Policy Framework granting equal status to HIA and EIA, plus the supplementary requirements from subordinate HIA guidance in local, these strategies do make HIA work as a more independent status that mitigates some issues caused between different legislations and/or between different agencies, however, it is still substantially an EIA-based HIA.

Through the second pattern derived from Canada and Australia, it starts to show the complexity of multiple legislations—EIA legislation and planning legislation in this pattern. The HIA jurisdiction is conferred to local planning legislation and then planning agency by EIA legislation of higher level, presenting the most common way of implementing HIA in local level in global practice (including pattern 2, 3 and 4), which is consequently under EIA framework. Whilst notably in national level, it is an EIA agency to deal with cultural heritage cases, generally with federal cases such as heritage sites registered at the national level or federal properties, or issues at the national level or of cross-regional feature. On this basis, Canada and Australia both raise the importance and the jurisdiction of indigenous cultural heritage issues to the federal level, which implies local planning agency is deemed not competent in dealing with community engagement and the rights of minorities.

It is even more interesting to see a pattern with three legislation hierarchies involved, a situation shown by the third pattern used in the US. The left part of this pattern is identical to the second pattern, revealing the influence from US NEPA on enacting legislations in Austria and Canada; the only difference is that, instead of imposing supplementary requirements from subordinate HIA guidance in local as shown in the second pattern, in the third pattern a heritage legislation (i.e. NHPA) has been introduced conferring subsidiary HIA jurisdiction to authorised agency of different levels. This integration strategy apparently illustrates an intension to redeem the inadequacy of EIA-based HIA implementation. Besides, the heritage

legislation also enhances the supervision between authorised agencies of different levels (e.g. appointing state heritage agency- SHPO). As the pioneer of EIA, it is evident that the US government endeavours to better integrate HIA into the existing EIA framework at every level (NEPA and NHPA 2013). It has therefore improved the performance of HIA conduction, whilst it has also reinforced the EIA-based paradigm.

The fourth pattern, seen in China, demonstrates a system where HIA requirements have not been established, representing the situation when HIA system of a country is still developing. Notwithstanding this pattern with three legislation hierarchies looks similar in complexity with the third pattern, its conduction and performance of HIA is in fact very narrow and limited. This system encompasses two parts, not even statutorily integrated, that the left part for implementing 'environmental' EIA and the right part for implementing 'partial/informal' HIA. Whilst the left part seems to cover cultural heritage, the EIA legislation only requires the implementation of 'environmental' EIA on built heritage involved. Moreover, the only description regarding assessing impacts on built heritage is in the appendix of classification screening, not even in the main article. The 'environmental' EIA means it merely examines whether the pollution affects heritage physically. In order to improve HIA conduction, the right part, the heritage legislation has been introduced in this system, yet without substantively integrating it into or with the existing EIA process. Instead of requiring the substantive and formal implementation of HIA, the heritage legislation only appoints heritage agencies of every level as a subsidiary authority to review the projects and provide comments for approval agencies (i.e. planning agencies) for deciding whether to give building consent. The assessment, if there is one, can only be regarded as a consultancy rather than a formal impact assessment.

Notwithstanding different patterns representing different relationships between legislation and administrative system certainly have both advantageous and disadvantageous characteristics, there still exist some common issues and similarities amongst these patterns. Therefore, some preliminary but important findings can be drawn first, as follows,

- I. As shown in all the patterns, it seems inevitable that local planning authorities play the main role in implementing IAs, including EIA and HIA, as they are someone who is in charge of the development activities. It is therefore critical to HIA conduction that how planning legislation work with others (i.e. EIA or heritage legislation). The relationships are worth being explored, as different relationships

represent different issues, so that the patterns can help identify systemic problems (will be discussed in the next section).

- II. How significant US NEPA and the European Directive have influenced the global practice of HIA is clearly shown in all the patterns, which makes them all EIA-based.
- III. The patterns reveal the inadequacy of conducting HIA within EIA framework. For instance, the issue of classification screening, existing in all the patterns, as each pattern reveals the need of supplementary legislation instrument to help redeem the issue, including the subordinate HIA guidance in local level (pattern 1 and 2) and the introduction of heritage legislation (pattern 3 and 4). However, these supplementary legislation instruments still perform to a limited extent.
- IV. It is evident that there exists inconsistency (i.e. from different legislations), as well as discontinuity (i.e. lack of agency in certain level) between authorised agencies of different levels, as shown in the pattern 1, 2 and 3, which reveals a common problem amongst these patterns in terms of supervisory and policy communication within domestic HIA conduction. This may also lead to a tendency of approaching the AHD.

6.3.2 Identifying Systemic Problems from the Statutory Patterns

As the author argues the global practice of HIA has been misled by multiple discourses, such that the discourses obstruct the positive evolution of HIA, so far, the preliminary findings point the multiple discourses to the AHD and the discourse of putting HIA under EIA's framework. The author then further uses the patterns found to help identify systemic problems, as these systemic problems are supposed to reflect and manifest the connections with the AHD and the EIA related discourse, if these two are indeed the multiple discourses that predominate the current HIA paradigm.

I. Screening process of EIA incompatible with HIA

As we can see from the patterns, almost all the approval agencies are conferred the primary jurisdiction of HIA (arrow line) directly or indirectly by national EIA legislation instrument. Only one approval agency (regional level) in pattern 3 is conferred the primary jurisdiction by heritage legislation, whilst the approval agency mainly works on supervising local approval

agency rather than directly carrying out HIA. This elucidates the reason why screening process of EIA has become a statutory task in almost all the approval agencies, implying following statutory processes of EIA has formed part of the HIA paradigm in global practice.

Screening is the initial stage of EIA, used for appraising whether a proposed project is likely to have a significant effect on the environment and whether it falls within the realm of the regulations, to determine the necessity of an impact assessment. The screening process of EIA is essential towards natural environment, as every proposed project is involved with natural environment somewhere on the planet whilst it is no way to apply EIA on every project. One can hence perceive the screening method was developed originally for ordinary EIA cases—natural environment as the only object—concerning mainly about pollution and ecology aspect. Base on pollution viewpoint, most of EIA legislations stipulate classification screening rules with some thresholds or criteria, usually the scale and type of proposed project. The influential European Directive is one of the examples that screening decisions are made according to the characteristics of the proposed development, as opposed to those of the receiving environment. It leads to quite a few European national followers also applying the classification screening rules in their EIA framework to deal with cultural heritage, whilst these followers are advanced and influential in heritage conservation. The consequence is imaginable that some proposed projects that are expected to cause adverse impacts on cultural heritage may be ruled out through screening process by scale thresholds and type criteria (Jones & Slinn, 2008).

The unclear definition of cultural heritage in IA legislation is another common issue in terms of screening process, particularly in EIA legislation. A broad and vague definition of cultural heritage in EIA provisions usually leads to narrow and restricted applications. It is natural and inevitable for the authorised agency (i.e. mostly planning agency) whose expertise is not in heritage conservation to use their domestic statutory listing or designation system to proceed screening process. Notwithstanding the diversity of cultural heritage in heritage conservation has been acknowledged, from sites or buildings to the landscapes (e.g. cultural landscape), and covering tangible and intangible sphere, the listing systems are usually narrow in terms of category of heritage and often fail to keep up with the pace of evolution in heritage management. Besides, the listing systems are usually material-based, age-oriented and authority-valued (Byrne et al., 2003). Following listing systems is a cause and also a consequence of the tendency that the authorised agency focuses only on archaeological sites

and historic buildings (King & Kendall-Miller, 2016). This over-simplifying and overlooking tendency can cause failure of identifying cultural heritage affected.

The expertise and attitude of implementing HIA are apparently issues in EIA-based screening process. As we can see from Figure 6-1, in all the patterns, the approval authorities at local level are planning agencies, which means planning agencies generally in charge of the screening process to decide whether a case needs to implement IA or not. Since planning agencies deal with relatively much more EIA cases regarding natural environment than cases involving cultural heritage, they usually have competent expertise in proceeding screening of EIA that is without cultural heritage involved, especially with such simple classification screening rules to follow. However, there are still many countries of which the planning agency is not competent to deal with all cultural heritage cases by themselves. When struggling to make decision for an EIA case involving cultural heritage, the screening authority (i.e. planning agency) usually refers the decision-making of screening to heritage agency of local government. This is therefore the situation forming a tendency of ignoring cultural heritage or overlooking some types of cultural heritage they feel difficult to deal with, for instance undesignated heritages or registered but not designated types, as the planning agencies tend to keep the decision-making simple, and more importantly, in their hands. Numerous studies therefore have called for limits on discretion in screening of EIA (Macintosh & Waugh, 2014). Notwithstanding there are legislation of some countries addressing that HIA is not restricted to official designations, the attitude and expertise of an EIA-based screening process are still the key factors (King, 2016; Teller & Bond, 2002). Likewise, this situation also leads to the lack of consideration towards intangible dimension, let alone the social significance. Once intangible or social dimension is the main element being affected, HIA is very likely to be exempted because of agency's incapability of identifying the impacts. From the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework substantially affect the HIA paradigm in this respect.

II. Distinctions of scoping between EIA and HIA

As we can see from the patterns, all the approval agencies that are responsible for implementing HIA are either planning agencies or EIA agencies (at national level of pattern 2 and 3); those agencies are usually familiar and competent with ordinary EIA scoping (i.e. without cultural heritage involved), because they are originally conferred the primary jurisdiction of EIA directly or indirectly by national EIA legislation instrument, before the

introduction of HIA into EIA instrument. In other words, they are there originally for EIA, not for the sake of HIA. The connections shown in the patterns reveal the fact that EIA agencies and planning agencies as an approval agency both have a tendency of physical-based thinking, which will be explained in the next paragraph. This elucidates why inadequate scoping requirement in EIA has become an issue in HIA implementation, implying it has formed part of the HIA paradigm in global practice.

For planning agency as approval authority, scoping does not seem to be an issue in EIA cases without cultural heritage involved, whilst in EIA cases involving cultural heritage, it is rather problematic. The EIA scoping dealing with natural environment is relatively simpler than that with cultural heritage, in terms of selecting the expertise and object. As EIA mainly focuses on physical aspects, the required expertise is determined depending on the affected objects (e.g. water resource, vegetation, ecology, geology), which is relatively easy to select. Whilst in HIA, in addition to physical aspect, there are also anthropic aspects that need to be considered, as fabric is not the only essential of heritage. HIA thus may involve various types of experts including planners, architects, conservation architects, archaeologists, historians, environmental historians, culture anthropologists, sociologists, civil engineers, landscapers and even tourism experts. However, it reflects two prominent problems encountered in the practice of EIA-based HIA. One is that many authorised agencies have been struggling selecting appropriate expertise, which has been evidenced by the prominent tendency of confining expertise to archaeology and architectural conservation. The other problem is that scoping is not generally acknowledged as an essential and necessary process in EIA framework, as there are some countries leaving scoping as a voluntary work in EIA legislation (e.g. UK) following the guidance from European Directive (i.e. scoping as voluntary) (Jones & Slinn, 2008; King, 2000).

As to determining objects to be assessed, people and material should not be separated in the scoping of HIA; a HIA ignoring the critical role of people as a main recipient of impacts can never achieve well consideration on intangible sphere of cultural heritage. The community living in the heritage and the community living in the surroundings are both the essential objects of HIA. However, it can be seen from many EIA legislation instruments that, even though they have underlined to assess impacts on intangible aspects, they usually fail to address in implementation due to their material-based framework. Moreover, the concept of setting is seldom introduced in EIA legislation thus far. In spite of a few EIA legislations applying it, they merely apply the setting narrowly for concerning about visual intrusion. From

the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework prominently dominate the HIA paradigm in this regard.

III. Idea of resource and compensation in EIA

As we can see from the patterns, all the approval agencies that are responsible for implementing HIA are either planning agencies or EIA agencies (at national level of pattern 2 and 3); those agencies are originally conferred the primary jurisdiction of EIA directly or indirectly by national EIA legislation instrument, before the introduction of HIA into the EIA instrument. The main idea coming from EIA legislation leads to perceiving environment as 'resource' to human, no matter natural or built environment, which makes environment being considered compensable from human's viewpoint. Moreover, planning agencies are problem-solvers, which means they have a tendency of playing scales with gains and pay in order to achieve the ultimate goal of development (Pendlebury, 2013); the idea of resource compensation rooted in EIA is hence ideal for them to apply to 'heritage resource'. The connections shown in the patterns elucidates why the idea of compensation and resource of EIA has become a risk in HIA implementation, implying it has formed part of the HIA paradigm in global practice.

The use of environmental compensation as a measure of mitigation is widely applied in many EIA legislations; US NEPA and the European Directive are certainly no exception (Rundcrantz & Skärbäck, 2003). Environmental compensation is a concept in order to protect, enhance, restore or improve the damaged or scarce nature resource that basically encompass biodiversity and ecosystem. It reveals the idea that natural environment can be compensated by restoring or improving biodiversity and ecosystem, at damaged area or at other areas; it also reveals natural environment is deemed as natural resource that can be used and exploited by human. The philosophy of compensation and resource may be reasonable in EIA in terms of natural environment, whilst they are inappropriate for cultural heritage. When implementing HIA under EIA's framework, whether the impact assessment is conducted by an independent commission or by other heritage agency referred, the decision-making eventually falls back in approval agency that is usually planning agency, or even EIA agency; it can therefore lead to the tendency of applying compensation measure to balance the loss of heritage value (due to lack of heritage agency as approval authority). A better tourism development and local economy improvement are common compensation examples as well as pleasing excuses; nevertheless, the loss of cultural heritage can never be restored. It gives the explanation that

decisions on whether projects should proceed rarely hinge on cultural heritage issues in EIA (Jones & Slinn, 2008).

The idea of regarding cultural heritage as cultural resource reflects the tendency of reification in EIA, treating cultural heritage as an entity rather than living social action (Byrne et al., 2003). US NEPA is an example applying 'cultural resources' as a term in its EIA framework, which to some extent leads to misunderstanding and limited performance that focuses mainly on archaeological remains and historic properties (King, 2000). The use of the term cultural resource management (CRM) also commonly existed in Australia by the early 1980s, but by the 1990s it had been abandoned in favour of 'heritage management' (Byrne et al., 2003). From the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework prominently affect the HIA paradigm in this respect.

IV. Unfavourable to community involvement

As we can see from the patterns, all the approval agencies of local level are planning agencies who are conferred the primary jurisdiction of HIA (arrow line) directly or indirectly by national EIA legislation instrument. Since planning agencies of local level are the authority who has most chance of confronting community issues, they also have better opportunity to achieve community involvement in their work. However, as communities usually stand against developers, which makes communities troublemakers from the viewpoint of planning agencies. In other words, community involvement is often regarded unfavourable by planning agencies. It can be manifested by the fact that indigenous cultural heritage cases are carried out by EIA agency of national level in pattern 2 and 3, due to the incompetence in promoting community involvement and rights. This elucidates why community involvement has become a common weakness of approval agencies of local level, implying it has formed part of the HIA paradigm in global practice.

Notwithstanding public participation have been widely emphasised and applied in most of the EIA legislations, there is still much research indicating the insufficiency and inadequacy in terms of community involvement in EIA cases involving cultural heritage, especially in indigenous heritage cases as mentioned in the last paragraph. Moreover, the difference between public participation and community involvement in terms of purposes and objects has been overlooked; they have been mixed up in both EIA and HIA. Public participation in EIA is originally applied for natural resource allocation, whilst community involvement is mainly for

cultural heritage conservation and highlighted for other purposes. As in natural environment cases in terms of natural resource, it is prone to find a convincing and objective scientific approach to assess the impacts (e.g. water quality, geological stabilisation) during the assessment stage without the public; public participation is hence usually applied in EIA for dealing with resource allocation. Public participation in EIA is hence generally required only during the decision-making stage, and the influential European Directive is such an example. However, instead of centring on the idea of resource allocation and compensation, community involvement in HIA is mainly for eliciting and protecting cultural significance in the assessment stage. It would be difficult in achieving sufficient community involvement of HIA by EIA framework that is prone to mislead public participation as a political wrestling. It turns out some perfunctory practices created by planning agency, for instance, instead of inputting indigenous people's own values into the assessment process, the community involvement in some Australia HIA cases was just bringing indigenous people into the work of archaeology (e.g. helping record findings, sieving dirt on excavations), for superficially fulfil the goal (Byrne et al., 2003). From the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework prominently reflect on the HIA paradigm in this regard.

V. Disconnection natural environment from cultural heritage

As we can see from the patterns, all the approval agencies are conferred the primary jurisdiction of HIA (arrow line) directly or indirectly by national EIA legislation instrument. Although in pattern 3 we can see subsidiary jurisdiction of HIA (arrow dash lines) is conferred by heritage legislation, and in pattern 4 heritage agencies provide review consultancy, all four patterns still show a common and typical relationship—EIA is the primary role whilst HIA is the subsidiary role in the whole system. This relationship has hence then perceived by approval agencies, mainly planning agencies, who consider themselves as neutral position such that they are prone to separate a case into two tasks if necessary, one for environment expertise and the other for heritage expertise. Pattern 4 is a prominent example in this regard, whilst other patterns also apply this tendency without presenting it statutorily on the pattern. This elucidates why separation between natural environment and cultural heritage has been formed by approval agencies, implying it has formed part of the HIA paradigm in global practice.

The discourse of assessing cultural heritage within EIA framework seeks to convey an idea that the impact assessment can and will cover both cultural and natural aspects and also

give a more comprehensive consideration regarding the interactions or cross effects between them. However, in practice, it is not the case (ICOMOS, 2011). As the expertise of the two sides are distinct, approval agency (i.e. usually planning agency in local level) generally divides a EIA case into two parts, and then carries out these two tasks respectively with different practitioners and/or commissions. Each side usually considers its own concerns and potential impacts, for instance, environment side may be concerning for the efficiency of water resource utilisation or the security of a dam structure without realising it could cause adverse effect towards cultural landscape or sacred place of community nearby; environment side may be considering the effect of lowering underground water without realising it could cause the drying of a hot spring lake that is in fact of cultural significance towards heritage and local community; and environment side may not be able to be aware of whether the effect of making ecosystem compensation affects the social dimension of heritage community. When regarding cultural heritage as part of natural environment as the patterns reflect, it implies ignoring the idea that natural environment is also part of cultural heritage. It then turns out the ignorance of heritage value or significance contributed by nature. From the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework prominently shape the HIA paradigm in this respect.

VI. Disadvantageous to building supervisory and appeal system

As can be seen from the patterns, there exist inconsistency and discontinuity between approval agencies of different levels. All the patterns have a local approval agency, whilst not all of them have supervisory authority at upper level (i.e. red arrow represents supervisory relationship). The advantage of having approval agencies in every level can be seen when dealing with issues of higher level or cross-regional developments as mentioned earlier, as well as when a problem cannot be solved at the local level and it is hence passed to a higher level (Teller & Bond, 2002). The higher approval agency plays a role of supervisor, as well as that of a supporter to the local agency, avoiding situations such as the issue faced by Liverpool City Council when it had to defend itself against the World Heritage Centre's decision of placing Liverpool's Maritime Mercantile City on the list of World Heritage sites in danger due to inappropriate development, without any support from upper authority. More importantly, having approval agencies in every level also facilitates appeal system for cases in which impacts have been underestimated, launched by community or expertise societies. The patterns also illustrate the feature of inconsistency in terms of the type of approval agency in different

levels, for instance in pattern 2 and 3, which is disadvantageous in policy consistency and policy communication. The administrative system formed by the relationship between EIA legislation and other legislations is apparently unfavourable for the building of supervision and appeal system that are expected to be critical in the application of bottom-up approach of heritage conservation. From the foregoing discussions of this systemic problem, we can see the AHD and the discourse of putting HIA under EIA framework substantially affect the HIA paradigm in this regard.

VII. Ignorance of monitoring and post-evaluation in EIA framework

Notwithstanding monitoring and follow-up task have been advocated in many EIA literatures, unfortunately, the European Directive does not include requirements about them, leading to a similar ignorance amongst many European member nations (Teller & Bond, 2002). Monitoring and follow-up task are more important in HIA than in ordinary EIA (without cultural heritage involved) because of two reasons. On one hand cultural heritage may involve undiscovered remains, in such cases it would be necessary to use monitoring as a form of impact mitigation to protect the undiscovered remains during development stage. On the other hand, since the social dimensions of cultural heritage, including societal status and social significance, feature dynamic and ever-changing character of impact, the follow-up task is therefore critical to the effectiveness of HIA in sustainability of heritage community. Moreover, post-evaluation can also be applied as an assurance of community involvement in HIA.

However, from the patterns we can see heritage agencies which are relatively more competent in monitoring and follow-up task do not play crucial role as approval agency (mostly planning agency). Only one approval agency (regional level) in pattern 3 is conferred the primary jurisdiction by heritage legislation, whilst the approval agency mainly works on supervising local approval agency rather than implementing HIA. In pattern 4, heritage agencies are just review agencies and lack of jurisdiction in formal HIA. From the discussion of this systemic problem, we can see the inadequacy caused by the indifference of EIA in this regard, revealing HIA is misled by the discourse of putting HIA under EIA framework.

6.3.3 Summary—HIA Misled by the Add-on Discourse and the AHD

Through the exploration of the systemic problems from HIA statutory system, it is evident that there exists an add-on discourse that shapes the current HIA paradigm and obstructs its

positive evolution, in addition to the AHD. The add-on discourse originated from environment domain, leading to HIA being dominated by EIA. More importantly, the AHD reinforces the add-on discourse, which implies the fundamental way to reshape HIA paradigm is by tackling these two discourses simultaneously, as well as by improving the current HIA approach that is contended by the author as incomprehensive assessment and AHD-dominant.

This research hence contends that in order to achieve satisfying performance of HIA conduction, HIA should be completely independent from EIA in terms of statutory system and should be equally placed in statutory system with the primary jurisdiction from heritage legislation, as the way EIA legislation confers jurisdiction to the authorised agency. However, the prerequisite is to change the logic of thinking regarding the relationship between cultural heritage and natural environment, from a territory-oriented and add-on (i.e. add culture heritage on natural environment) view to a holistic heritage view (to include heritage, context and nature) that is mainly discussed and developed in Chapter 5 (Figure 6-2). The change of logic also reflects a reversal of main role and supporting role—HIA no longer plays a supporting role in the EIA framework, instead, HIA and EIA both should play as main roles respectively and parallelly with their own systems. An independent HIA statutory system can also contribute to the efficacy of appeal system, which is manifested as critical to supporting bottom-up approach of heritage conservation. Moreover, an independent HIA should consist of three main elements: heritage, context (i.e. highlighting people and social sphere of the setting) and natural environment; all are considered imperative for achieving successful HIA conduction as the emphasis on people living in the heritage and the setting allows HIA to achieve better considerations on intangible aspect, social significance and community involvement. It also furnishes a different lens to identify and protect the value from nature.

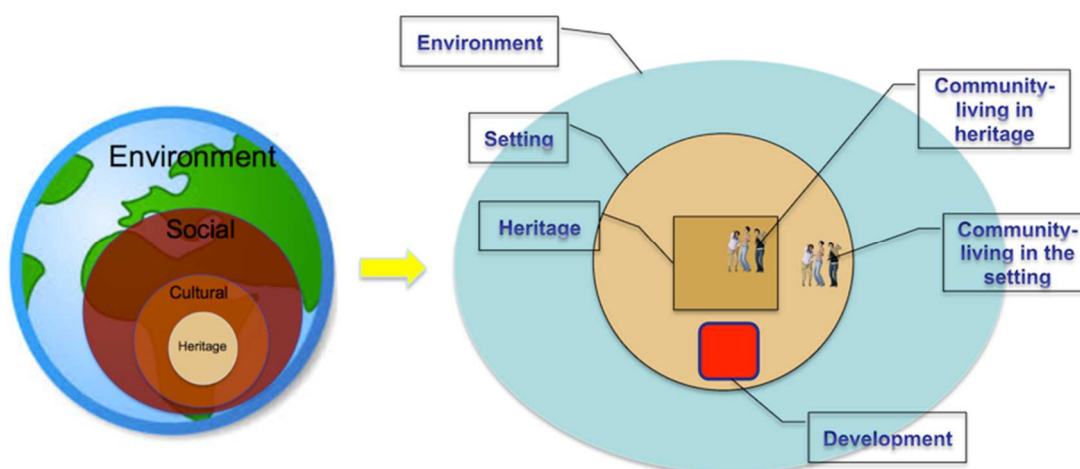


Figure 6-2. EIA-based/add-on logic (left) and holistic HIA view (right).

6.4 A New HIA Matrix Approach

6.4.1 Development of a New HIA Approach

The values-based approach has generally been recognised as a fundamental theory of modern heritage conservation (De la Torre, 2013); identifying and protecting cultural significance is indeed the main purpose of conservation. Not surprisingly, it has also been widely applied in the development of other conservation theories and practical approaches, such as intervention theory and HIA approach. However, the values-based approach has reflected some theoretical and practical issues and contradictions, as reviewed in Chapter 2. With the values-based approach and minimal intervention approach being directly applied in HIA, it goes without saying that these issues are taken on board by HIA, and sometimes even more problematic due to the influence of some discourses (e.g. the AHD). Therefore, in order to reshape the current HIA approach, it is necessary to examine the issues and inadequacy of the values-based theory in terms of the application of the theory in HIA approach. This work has been made in Chapter 5, which points out six shortcomings in terms of the application in intervention. As HIA is developed with the concept from the intervention theory, the HIA research hence applies the proposed intervention matrix as the framework of HIA approach, for further developing HIA approach in this section (Figure 6-3).

Like the idea of intervention, the current HIA approach also focuses on value as the sole assessment dimension; and the assessment object is merely heritage, at most containing the surrounding landscape for authenticity concern. The coverage of the assessment object apparently also revolves around the materialism dominated by the AHD as proposed by Smith (2006), as well as around its preferred elite aesthetic value. In addition, the AHD has also reinforced the dichotomy in practice that strips intangible elements from tangible ones and excludes nature from culture (Smith, 2015). The current HIA approach ignores the fact that ‘human’ is the main role of cultural heritage rather than material; it ignores the values and effects of social respect caused by human; and it also ignores the importance and criticality of ‘interaction between human and nature’ that is the cause of the formation of cultural heritage. Therefore, based on the proposed intervention perspective, the new framework proposed for HIA encompasses three assessment objects—heritage, context and nature, intending to reload ‘people’ and ‘nature’ onto the evaluation system of HIA, for preventing HIA from continually being dominated by AHD, and for enhancing the integrity of assessment objects.

Since the development of the three objects and three aspects are discussed at length in Chapter 5, this section mainly adds some important points that are easily overlooked in the current approach and sets out what the ideas and concerns with respect to impact assessment the six elements of the matrix represent (i.e. heritage, context, nature, value, sustainability, and resilience), for guiding users to achieve comprehensive assessment with the matrix approach.

6.4.1.1 Value Aspect (V1, V2, V3)

In the new proposed HIA approach, ‘heritage’ encompasses not only the material, but also the community living in the heritage. The ‘context’ encompasses not only the landscape around the heritage, but also the community living in this setting, as well as what is even more emphasised here—the literal meaning of the ‘context’. It implies the social conditions and background, such as culture, economy, and politics, as social dimension and heritage social value continue to interact with and contribute to each other (Mason, 2002). In order to enable HIA to elicit diverse heritage values, intangible dimension and social inclusion that used to be achieved only at rhetorical level in the past, can be embodied and ensured through the emphasis on the community and social value by clearly defining the assessment objects as ‘heritage’ and ‘context’.

Many practical experiences from indigenous heritage conservation have reflected that the currently dominant approach in cultural heritage conservation that focuses on materiality and overlooks human and intangible dimension is no longer adequate (Brockwell et al., 2013; Karlström, 2013; Pocock, Collett, & Baulch, 2015). Not merely are there debates reflected from the category of the indigenous heritage, but also as the concept posited by Smith, that ‘all heritage is intangible’ (Smith, 2015). The dichotomy between tangible and intangible is going to be critically re-examined in the future, and for this end, intangible is given equivalent weight in the proposed HIA approach.

In addition, another purpose to include the ‘context’ as an object is for recovering and ensuring social values that has long been neglected due to AHD. Only by emphasising and substantially implementing the protection of social value, community engagement and social inclusion can be achieved to more than rhetorical levels and forms (Waterton & Smith, 2008). The main meaning of community engagement is to enable local to express and determine the significance of their cultural heritage, as well as to concern and protect the ‘social significance’ that Byrne (2003) has emphasised. Also, with such a bottom-up way of eliciting values, we would be able to mitigate the existing HIA notion that naturally has a tendency towards

absolute, dominant top-down paradigm, and further to rethink heritage as a social action, so as to augment cultural diversity and value plurality, and ultimately to realise social inclusion. Otherwise the current HIA can only achieve an ineffective community participation, as Byrne (2003) describes, ‘The present system is very telling in terms of where heritage values are seen to be located: in the field rather than in the community’, and as his Australia HIA example bringing indigenous people into the archaeology work. On the other hand, the demand and trend of cultural heritage conservation have made the methodological basis expanded from site-based approach to landscape and city; the decision in heritage conservation can often affect more people's life and wider society (Byrne et al., 2003; De la Torre, 2013). Besides, social value is dynamic and is constantly influenced by cultural background, social trends, politics and economy conditions (Mason, 2002). It contains not only social significance of the heritage community, but also the value to the public, formed by heritage or its related social processes. Therefore, focusing on social value and social significance of the ‘context’ as one of the main assessment objects can distinguish the new HIA framework from the existing approach featuring overemphasis on fixation in the past, materialism and social exclusion (Pendlebury, 2013), and can help defend against the perspective confining notions of ‘social value’ to the realms of ‘subjective emotional attachment’ (Smith & Waterton, 2013).

The third assessment object of the proposed HIA approach—nature—refers to the natural environment and ecology where the cultural heritage is located. It cannot be denied that some of the cultural heritage discourses are developed from or influenced by the field of environmental protection (Karlström, 2013); and some environmentalists or nature conservators also attempt to directly extend the application of their discourses to cultural heritage field. Yet this is based on one inappropriate assumption of considering cultural heritage as the same as natural resource that inherently possess intrinsic values (Byrne et al., 2003; Rami, Mason, & de la Torre, 2000). Such add-on approach that directly get cultural heritage onto the map of nature lacks substantial efficacy and even leads to the ignorance of cultural heritage or its being left aside, particularly with respect to intangible sphere (Brockwell et al., 2013). Adding the requirements of cultural heritage onto EIA legislation is such an example. However, even if there are huge difference between cultural heritage conservation and environmental protection in terms of methodology and discourse, this does not mean that nature should be excluded or separated from the scope of cultural heritage conservation, which has been discussed at length in Chapter 5. After all, cultural heritage is created by the interaction between human and nature. Therefore, the new HIA approach

contends that nature should be regarded as one of the assessment objects to be examined, whether it be a natural resource and ecosystem with intrinsic value, or an attributed social significance due to human's interaction with nature (Pocock et al., 2015).

6.4.1.2 Sustainability Aspect (S1, S2, S3)

A recurrent criticism of EIA is that they do not adequately address cumulative impacts and uncertainties (Benson, 2003). Assessing cumulative impacts on heritage value sounds abstract and impractical, whilst assessing cumulative impacts on sustainability sounds reasonable and appropriate. On the other hand, similarly, it is difficult to associate uncertainty with the impact of value, whilst using resilience is rather suitable. Therefore, in addition to the value aspect, the proposed approach is the first to address other aspects—sustainability and resilience—so as to achieve multi-dimensional appraisal. The considerations towards these two dimensions are exactly something the existing approach is lacking. In this matrix, sustainability emphasises on the continuity of long-term timespan, as well as on people and societal sphere; and resilience mainly considers the external variables (e.g. human-induced disasters, nature disasters and climate change) in addition to the proposed action, as well as in risk respect.

The sustainability of the impact recipients (namely heritage, context and nature in the proposed matrix) depends on the interrelations between 'internal capabilities' and 'external constraints.' The existing HIA approach assumes that either value is the only thing that can be affected, or anything affected will eventually reflect on change in value. Consequently, it ignores the possibility that 'internal capabilities' and 'external constraints' can be affected even under the circumstance that value is unaffected. Common example such as inappropriate over-development of heritage tourism, even though value may not be affected and changed by development actions, it can still cause the loss of sustainability in long-term respect. It is hence suggested to use internal capabilities and external constraints to assess the impacts of sustainability.

Furthermore, the sustainability aspect that underlines people and time as the core concerns can be a cure for fixing the tendencies of bias and exclusion with respect to value. The value of cultural heritage is deemed contested and ever-changing, which is also prone to be influenced by social conditions (Byrne et al., 2003; Little, 2014; Mason, 2002). Through the examination of the sustainability aspect that features long-term, flexible, diverse, and inclusive towards value, it is expected that the AHD's tendencies of fetishism, value dominance, and preference for division of history can all be mitigated. Also, through the dialogue between the

sustainability aspect and the ‘context’ object, the matrix reinforces the role of social value in HIA and avoids the situation that the social value has long been marginalised (Byrne et al., 2003). Besides, through the examination towards value inclusion and intergeneration, the sustainability aspect avoids HIA becoming a tool of social and cultural assimilation (Waterton & Smith, 2008, 2010). In summary, what the sustainability dimension contributes to HIA conduction is a notion that HIA should protect cultural significance along with the social values of community, rather than focusing on national importance identified by top-down paradigm (i.e. authority’s heritage value) (Emerick, 2014).

From the characteristics of the existing HIA approach and the AHD, one can imagine that as such material-oriented approach only pays attention to the heritage that has already been discovered and identified (Byrne et al., 2003); under the cooperation of administrative system and statutory listing, even undesignated cultural heritage are often excluded from HIA. The proposed approach not only advocates that HIA should include undesignated cultural heritage, but also suggests ‘undiscovered’ remains should be considered and evaluated. In fact, it is often that heritage is overlapped with undiscovered remains of other periods at the same location. These undiscovered remains or heritage, whether they have been foreseen or have not yet been predicted, are often found or encountered during the implementation of HIA or the undertaking of proposed development. Due to unclear regulation or neglect in the existing HIA approach and legal system, there are many inappropriate treatments or avoidable negative outcomes consequently being made. Therefore, the new HIA approach also addresses the necessity to examine the potential impact of proposed action on unexplored part from the viewpoint of sustainability.

6.4.1.3 Resilience Aspect (R1, R2, R3)

In addition to sustainability, the proposed action is also likely to affect the recipient's ability to withstand against and recover from the third-party’s shocks even under the circumstance that value is unaffected. The ability is what we mean ‘resilience’ as the third dimension. The existing HIA is under an assumption that the proposed action is the only source of the impact, ignoring that there exist impacts from the third-party (e.g. human-induced disasters, nature disasters and climate change) at all times, and that there are interactive effects between the proposed action and the third-party impact. For instance, a proposed development may do some activities that decrease the geological stability of a slope. Consequently, what could be changed is not the value of heritage and community below the slope, rather, is the increased

probability of a landslide caused by a heavy rain, especially when nowadays climate change often leads to unpredictable extreme strength of rainfall that never happened in the past. This type of indirect and cumulative risk from the third-party impact can easily be overlooked by the existing HIA approach only assessing the value dimension, which can often lead to devastating situations and are certainly unacceptable to cultural heritage. Resilience underscores the perspective of risk and uncertainty, which contains three essential elements—vulnerability, hazard and exposure. Vulnerability is equivalent to the ability of resistance against disasters, which is also limited or supported by external social and economic conditions. Hazard is the probability of disasters, including natural disasters and human-induced ones. Exposure is the predicted extent of damage. The three elements enable HIA to present a more quantitative and strategic assessment in terms of impact of resilience, so that the decision maker can consider how and what to mitigate the potential effects. It is hence suggested to use vulnerability, hazard and exposure to assess the impacts of resilience. In addition to two objects of ‘heritage’ and ‘nature’, even more importantly, the matrix particularly underlines the ‘context’ object under the examination to the resilience dimension, which is the social resilience of community, in order to enable HIA to prevent the devastating outcome towards people and intangible heritage due to the ignorance of disaster management and prevention.

It should be noted that the key points presented in the matrix table (Figure 6-3) are not used as exhaustive guidance, instead, the content should be different in different cases and it is to demonstrate the way to elicit some crucial impacts that are prone to be neglected, as the intention of proposing the HIA matrix is to provide a better way of thinking to derive comprehensive consideration towards HIA, rather than to provide a fixed guidance as international charters. The matrix seeks to address something different with the current HIA approach, or something that is prone to be overlooked in the current approach. With this flexibility, the matrix can certainly be applied to a variety of cultural heritages. The differences between the applied cases will be different in the proportions of the three objects—heritage, context and nature. The effective continuity of practices and knowledge that constitutes ‘intangible’ heritage is dependent on the social condition and wellbeing of the community, as well as the availability of material resources and spaces. Tangible and intangible element are therefore interdependent (Pocock et al., 2015). All of them cannot be separated from nature. Culture was built on the nature, whilst in cultural heritage nature can often be seen as part of culture. In the next section, this article then uses water heritage as the manifestation of the HIA

matrix, as water heritage makes it easier for people to understand and conceptualise the relationships between the three objects (i.e. the heritage, context and nature) and the three aspects (i.e. value, sustainability and resilience), as well as the necessity of them in HIA. Ironically, water heritage is exactly the victimized category easily overlooked by AHD.

	Heritage	Context	Nature
Value	<ul style="list-style-type: none"> ● ICH of living community ● Cultural significance (particularly from local's view) 	<ul style="list-style-type: none"> ● Social significance (to community) ● Social value (to the public) ● ICH of living community ● Cultural landscape 	<ul style="list-style-type: none"> ● Natural resource ● Ecology ● Interaction between human and nature (social significance)
Sustainability	S1 <ul style="list-style-type: none"> ● External limitation <ul style="list-style-type: none"> ➢ Institutional ➢ Instrumental ● Internal capacity <ul style="list-style-type: none"> ➢ To withstand natural force ➢ To withstand human activity ➢ Well-being of living community ● Intergeneration ● Plurality ● Undiscovered 	S2 <ul style="list-style-type: none"> ● External limitation <ul style="list-style-type: none"> ➢ Institutional ➢ Instrumental ● Internal capacity <ul style="list-style-type: none"> ➢ To withstand natural force ➢ To withstand human activity ➢ Well-being of living community ● Intergeneration ● Plurality ● Undiscovered 	S3 <ul style="list-style-type: none"> ● External limitation- resource utilisation ● Internal capacity- restoration ● Ecology and Biodiversity
Resilience	R1 (Towards human-induced and natural disaster) <ul style="list-style-type: none"> ● Risk (to heritage and people) <ul style="list-style-type: none"> ➢ Vulnerability ➢ Hazard ➢ Exposure 	R2 (Towards human-induced and natural disaster) <ul style="list-style-type: none"> ● Risk (to people and landscape) <ul style="list-style-type: none"> ➢ Vulnerability ➢ Hazard ➢ Exposure 	R3 (Towards human-induced and natural disaster) <ul style="list-style-type: none"> ● Risk (to natural resource and ecology) <ul style="list-style-type: none"> ➢ Vulnerability ➢ Hazard ➢ Exposure

Figure 6-3. New HIA approach presented as a matrix.

6.4.2 A Water Heritage for Manifesting the Proposed HIA Approach— Angkor

A water heritage example can manifest the advantage and necessity of the proposed HIA matrix that provides a different way of thinking for assisting the identification of the impacts

that can possibly missed by the current approach. The great medieval settlement of Angkor in Cambodia (9th–16th centuries) is famous for its monumental religious architectures. The temple architectures that are considered as of ‘outstanding universal value’ by World Heritage system with inscription in 1992, are merely part of the whole ancient city. Notwithstanding the whole heritage area features a ‘water city’ with an extensive and elaborate water network stretching across over 1,000 km² far beyond the World Heritage Park, its water heritage content is not considered as of OUV and has never attracted adequate attention as its architectural content, revealing the predominant values of the AHD in the practice to some extent. Notwithstanding the water heritage content is not recognised as of international or even national importance in respect of authorised value, it undoubtedly possesses significance in cultural, social, and ecological sphere to local community so that it is by all means worth being highlighted and protected.

After a long period of upheaval and wars (1960s–1991), regardless of the support from United Nations and other international sources, the poverty elimination has been the most demanding task in the country (Winter, 2008). The government hence relies on the development of tourism in order to recover the economy. Unfortunately, the development of tourism is much faster than the establishment of governance. The economy-driven policies and hasty infrastructure investments from the government, along with pouring hot money from tourism industry, have become adverse interventions to the heritage and society, not only causing impacts on value aspect, but also prominently on the aspect of sustainability and resilience. The research is going to review the impacts respectively, by using the proposed matrix with three aspects and three assessment objects (Figure 6-3).

➤ Value Aspect (V1, V2 and V3)

In terms of value aspect, this case study demonstrates there are some adverse impacts happening on heritage, as well as on context and nature, whilst only heritage, more precisely fabric, is under the concern of conservation. The harsh restriction set for WH management purpose against the property ownership of the residents living in Zone 1 of the WH area has affected their living and human rights (Gillespie, 2013). The indifference towards the heritage community reflects the preference of authorised value only on fabric, not on people. It reveals conservation management even sometimes sacrifices heritage bearers and intangible elements in order to achieve the protection of heritage fabric, which reflects the ignorance of impact on the value of heritage community living in heritage area (V1).

As for the context (i.e. setting, in Zone 2), similarly, a living landscape where people continue a traditional way of life has strong links with the ancestors who created Angkor 1,000 years ago or even with Pre-Angkorian period settlements. However, the significance of the cultural landscape in the setting of the heritage that features subsistence farming, religious practices, vernacular architecture, craft traditions and trade skills, has been overlooked in the conservation practice. It has only been emphasised on its aesthetic value, mainly for the purpose of tourism, indirectly leading to the loss of characters caused by the impact of tourism. It manifests that in heritage management practice, it is prone to have the tendency of focusing on aesthetic value in landscape respect dominated by the AHD (V2).

As for the nature (V3), the groundwater resource plays an essential role to the daily life of local community, as well as to the safety of the heritage structures. As the ancient city had been designed to sit on a base of sand, in order to keep the built structures stable in place, a constant and sufficient condition of groundwater is necessary. The design of moats and reservoirs hence has a main function in recharging to aquifer for mitigating the change of groundwater table caused by distinct rainy and dry season (i.e. extreme monsoon climate) so as to maintain the stabilisation of the foundations. There therefore existed a traditional religious ritual of worship towards water in the moats, which was the wisdom at the time to supersede a governing order so that people would cherish groundwater and the foundations could be secured. However, due to the impact from tourism, the significant groundwater is facing the situation of over-exploitation, potentially affecting the value of the heritage. It elucidates for one thing, the adverse impact of water environment has been ignored (V3), and for the other, the value of nature that contributes to heritage ensemble is prone to be overlooked in practice.

On the other hand, the Tonle Sap Lake located at the south of Angkor heritage has always been an important source and value of nourishment to local community. It is one of the most fish-abundant lakes in the world, which accounts for 40% of Cambodia's total supply of protein. Also, the annual flood at floodplain of the lake creates an optimum condition to cultivate floating rice during the rainy season and to cultivate flood recession rice during the dry season when water starts to recede (Kummu, 2009). The lake, fishery and rice production have been of critical value to local community (i.e. heritage community and community of the setting), whilst tourism activities and development has directly and indirectly caused adverse impacts on the production of fish and rice (V3). In particular, the loss of value in nature has also affected local people's feeling about their heritage; they feel the loss of value in nature

environment diminish the value and significance of the heritage, which also reflects the bond between heritage value, context value, and nature value, in terms of impact assessment.

➤ Sustainability Aspect (S1, S2 and S3)

The last two decades have seen some serious flooding and draught disasters caused by extreme weather condition of climate change. Since then, the government realised the key role the water system had played in the city operation, and hence undertook a series of repair and restoration works (Fletcher et al., 2008). After most of the water networks being restored to original function, the flooding and draught situations have been dramatically eased, which reveals the fact that the overlooked water heritage content indeed plays a critical role in terms of the sustainability of heritage and heritage community. It is a great example showing the intervention on water heritage content can cause positive impact on the sustainability of heritage, context and nature. (S1, S2 and S3).

Another story is about the minority of the local community. Local government once intended to evict around 170 Buddhist monks and nuns from pagodas that were deemed 'illegally built' due to the lack of the same historical authenticity and the dominate aesthetic performance as that of the ancient Angkor period. Fortunately, the issue was eventually eliminated by the effort of some international experts and local heritage authority that regard them as part of the living heritage community (Winter, 2004). It demonstrates that heritage value is usually contested, as well as authorised. Through assessing impacts on sustainability aspect, value plurality and cultural diversity can hence be protected (S1).

As to the context (S2), the blooming heritage tourism seems to merely contribute to the tourism industry. It has led to a worse economic inequality and inflation of price in the surrounding area, which has forced the local community to move out of the area, or to give up their traditional ways of making a living (e.g. agriculture, silk production) to work in tourism industry for a better income. On the contrary, a large number of new residents have moved in to earn a livelihood from tourism from other parts of the country. Plus a huge and growing number of tourists, the booming population has reflected many serious issues in resource utilisation and allocation, such as the lack of drinking water and foods, the inadequate capacity of treating wastes, and the change of land use (cultural landscape) into hotels and golf courts. All of these are the impacts affecting the sustainability of the community in the setting, in cultural, social, and economical sphere.

As to nature (S3), the conditions of the surrounding environment and ecosystem have been dramatically affected due to tourism activities. It can be seen from the changes of the three most important nature environments, Kulen Mountain, Siem Reap River and Tonle Sap Lake. Kulen Mountain is located upstream of the basin and north of the heritage area, which is connected by Siem Reap River flowing through the heritage area southwards to Tonle Sap Lake. Large forest areas of Kulen Mountain have been turned into rice fields in order to feed the booming population, or into resorts and golf courses for tourists. The serious deforestation has led to the lower water level in Siem Reap River, which affects fish migration pattern and fish production in the river and Tonle Sap Lake. Moreover, the change of flow volume has also caused erosion and sediment issues to the water heritage network and river system. Furthermore, the huge amounts of wastewater and garbage produced by excessive residents and tourists have been littered into the river, which have gravely polluted the water in the river and the lake. These issues reflect the impacts on the sustainability of nature.

➤ Resilience Aspect (R1, R2 and R3)

The last but not the least, resilience is the third key aspect that should be assessed towards impact. As the article mentioned earlier, the lack of clean water due to the excessive population and the severe pollution has led to the reliance on groundwater. The excessive exploitation along with inadequate governance towards groundwater has caused the risk of unstable foundation threatening the safety of heritage structures (R1). As to the context, the hygiene issues caused by the pollutions of the water and of the environment are getting more serious. Plus unbalanced industrial development, the status of social resilience has been seriously affected. Once an infectious disease or natural disaster happens, the community and even ecosystem will find it difficult to recover from the calamity (R2 and R3).

Through the elucidation with the water heritage, the case study manifests that the proposed HIA matrix have potential to achieve a more comprehensive assessment compared to the existing approach that solely relies on value dimension. It is an approach that can help identify potential impacts of which the AHD-dominated approach has a tendency of overlooking most impacts. Moreover, the proposed HIA approach contends that putting nature in HIA, rather than adding heritage into EIA, is a better way to simultaneously protect culture and nature. It does not mean EIA is not necessary in this Angkor case in terms of protecting nature environment. Nevertheless, the proposed HIA provides a different lens to identify and assess the impacts on nature. For instance, in the Angkor example, it is evident that all the

foregoing impacts regarding the nature object (i.e. V3, S3 and R3) cannot be identified through a typical EIA (i.e. no heritage involved) concerning tourism development and policy. It also manifests the necessity and advantage of replacing ‘nature’ back to cultural heritage management.

6.5 Conclusions

The findings conclude the author’s argument that not only in WH practice, but the global practice of HIA has been misled by the AHD and the add-on discourse of putting HIA in EIA framework. Through the investigation of five representative countries towards legislation and administrative system, the research derives four patterns, which further help identify seven systemic problems that reveal the two discourses shape the current HIA paradigm and obstruct its positive evolution. The seven systemic problems are: (1) screening process of EIA incompatible with HIA; (2) distinctions of scoping between EIA and HIA; (3) idea of resource and compensation in EIA; (4) unfavourable to community involvement; (5) disconnection natural environment from cultural heritage; (6) disadvantageous to building supervisory and appeal system; and (7) ignorance of monitoring and post-evaluation in EIA framework. The finding also recommends an independent HIA statutory system is necessary, which no longer plays a subsidiary role in EIA. In other words, HIA should divorce from EIA system and make a parallel system of its own, whilst ‘nature’ needs to be instead replaced in HIA framework, so as to realise the initial goodwill of EIA—achieving harmonious and holistic protection to nature and culture. Notwithstanding divorce always takes courage, it is instead the way to real unity, as well as harmony.

As the conduct of HIA mainly involves three aspects, namely legislation, administrative system and HIA approach, the former two aspects are examined and discussed to unfold the multiple discourses. Followed by tackling the third aspect—HIA approach—that has developed from the values-based perspective of heritage conservation, the author then proposes a new HIA approach based on the matrix perspective of intervention developed in Chapter 5. Through a case study of water heritage, it further manifests the potential and adequacy of the proposed HIA approach. The author hopes that the proposed HIA approach provides a more comprehensive and inclusive way to identify and assess adverse impacts and highlights the necessity and advantage of replacing ‘nature’ back to cultural heritage management.

Chapter 7 A Participatory Multiple Criteria Decision Analysis to Tackle a Complex Environmental Problem Involving Cultural Water Heritage and Nature

7.1 Introduction

The thesis has explored the harmony concept of ancient Chinese in Chapter 4, underlying the development of the matrix approach for assessing intervention in Chapter 5. It then further explored the practical sphere of managing change, namely HIA in Chapter 6. In the last part of the thesis, the author intends to use this chapter to further manifest the applicability of the developed matrix perspective and to show the significance of the ‘context’ that the thesis has been highlighting in terms of managing changes, whilst to develop relevant tool for supporting decision-making, for nourishing harmonious environmental management.

Multiple criteria decision analysis (MCDA) has been developed rapidly over the past quarter century with a variety of theories and models. Its capability to deal with multiple objectives or assessment criteria makes MCDA an ideal method to tackle environmental issues (Belton & Stewart, 2002; Kiker et al., 2005). However, as there emerge more and more complex environmental problems featuring dynamic characteristics, namely the unknown responses of society and policy recipients, towards the implementation of policy (Xidonas, Mavrotas, Zopounidis, & Psarras, 2011), without some proper adaptations it appears impractical to employ MCDA in these cases. Unlike ‘static’ problems that dominate existing MCDA literature (Ferretti, Bottero, & Mondini, 2014; Ferretti & Comino, 2015); such as ranking sites, plans and products with the assessment of criteria based on known conditions of facts or of something happened (e.g., cost, size, age, distance, functionality and accessibility, etc.); dynamic problems usually involve policy instruments that need to be assessed (i.e., scoring) based on future outcomes (what the author refers to as the scenarios of this research) to be logically forecasted and agreed before the policy instruments are chosen and implemented. Lack of confidence, or not being able to predict the impacts on society and the recipients of proposed policies or alternatives, is the main challenge and obstacle to the application of MCDA to dynamic problems. How to apply MCDA to dynamic problems with scenario

forecasting has yet to be demonstrated in the real world, which reveals a significant knowledge gap and is therefore the focus of this research.

The application of scenario analysis approach in management research has also increased dramatically in the last two decades; it generally develops methods to plan for the future, including scenario planning, scenario building, scenario forecasting, development scenario, foresight and future studies. Analysing and studying events that may materialise enables the organisation to understand the environment and how it develops over time, so preparing in advance for a scenario that may become real (Oliveira, de Barros, de Carvalho Pereira, Gomes, & da Costa, 2018). This feature gives rise to a new set of approaches in decision-making support, which includes an integration of scenario analysis and MCDA. With regards to this integration, most of the literature focuses on developing methods or frameworks for planning or building scenarios systematically and comprehensively in MCDA cases, rather than focusing on developing methods of forecasting towards future scenarios (for details please see (Gomes & Costa, 2013; Kowalski, Stagl, Madlener, & Omann, 2009; Oliveira et al., 2018)); the knowledge gap mentioned previously.

Within the MCDA field, tackling complex environmental problems involving dynamic unknowns includes not only future impacts and outcomes of the policy instruments but also the environmental change perceived by people, particularly in economic valuation, as it facilitates assessment. Some researchers have therefore recommended employing economic valuation methods along with MCDA, especially when addressing the opinion and response of the public towards environmental change in monetary value (Daron & Colenbrander, 2015; Lehtoranta et al., 2013; Turpie et al., 2000). However, there is scant literature illustrating this recommendation. Zoppi's article (2007) seems to be the only example that applies an economic valuation method—the contingent valuation method—to derive the relations between willingness to pay (WTP) and the dependent parameters that are to be used as the criteria in MCDA, namely for acquiring the preference of the criteria (i.e., weights) from the public. After the criteria weights being derived from the contingent valuation method, the weights then become an input into the analytic hierarchy process (AHP) method developed to yield the ranking result. In other words, deriving the weights from the opinion of the public by the economic valuation method is the highlight of the integrated MCDA method proposed. The article clearly presents the importance of the two unknowns—future outcome (i.e., scenario) and the economic valuation of environmental change—in dynamic environmental problems. This chapter focuses on how to employ economic valuation method as scenario forecasting,

which involves both of these unknowns and how to integrate the scenario forecasting approach into a MCDA method developed with participatory advantages for dealing with conflicts, so that the participants of the decision-making with conflicting opinions are better supported with the critical information (in economic valuation) that they need to proceed with the MCDA, particularly with a coherent preview of the scenarios. Scenario forecasting featuring public engagement and coherent preview is one of the participatory advantages highlighted.

Heritage conservation has often faced incompatibility with urban development and sometimes with environmental protection; all are of great importance. An environmental problem involving heritage can encompass conflicting stakeholders such as the historical community, the public, local authority, experts, NGOs and so forth. Representation of conflicting circumstance and multiple objectives in MCDA might be expected in these instances. Scrutinization of the literature review in heritage studies, however, shows that application of MCDA method in heritage management is much less than MCDA application in other fields (e.g., transportation planning, energy planning and land use planning); there is little literature existing. Ferretti et al.'s article summaries thirteen MCDA applications in heritage studies (Ferretti et al., 2014). Amongst thirteen papers summarised plus two papers written by Ferretti et al., fifteen in total, there are seven papers using MCDA for site ranking (Di Bitonto, Laterza, Roselli, & Rossano, 2010; Dutta & Husain, 2009; Ferretti et al., 2014; Ferretti & Comino, 2015; Fuentes, 2010; Giove, Rosato, & Breil, 2010; Thórhallsdóttir, 2007), six using MCDA + GIS for site ranking by mapping (Cerreta, Panaro, & Cannatella, 2012; Girard & De Toro, 2007; Hamadouche et al., 2014; Palmas, Abis, von Haaren, & Lovett, 2012; Paolillo, Benedetti, Baresi, Terlizzi, & Graj, 2011; Tarragüel, Krol, & Van Westen, 2012), one using MCDA for acquiring management priorities (i.e., importance of criteria) for ecosystem services (Bryan, Grandgirard, & Ward, 2010) and one using MCDA for plan ranking in a given area (Wang & Zeng, 2010). All of them are applying criteria with known information, which means none of them deal with dynamic problems or involves unknown scenarios, regardless of a high inclusion of heritage management. This reflects the knowledge gap mentioned in other fields applying MCDA.

Amongst the fifteen papers, there is one using monetary cost as a criterion of MCDA (Ferretti & Comino, 2015) and not any using utility or benefit as a criterion. This neglect of using utility or benefit as a criterion is also common in other fields applying MCDA, which does imply an inadequate selection of criteria. As any plan and policy instrument is considered an intervention, any notable impact caused by it, advantageous (e.g., utility and benefit) or

disadvantageous (e.g., cost), should be selected as criteria in MCDA; however, the concept of impact and intervention in heritage management is narrow and in need of improvement (Patiwael et al., 2018). Heritage conservation is dominated by the values-based perspective; this has led to a tendency to regard value as the only respect needed for assessing changes and impacts caused by interventions (Jokilehto, 2007; Walter, 2014); also revealing the inadequacy of consideration towards impacts. Through the integration of an intervention-oriented perspective (proposed in Chapter 5) and the concept of cost-utility into the value tree building of MCDA, the author seeks to reduce the knowledge gap of impact assessment in MCDA application and the scholarship of heritage studies. The value tree building approach can also assist communication between different experts (e.g., heritage, planning and environment practitioners), so as to acquire a more comprehensive consideration and performance of MCDA. It can also help heritage management practice catch up with the notable trend of the past two decades in heritage studies that shifts from a focus on physical preservation to a more inclusive view that underlines social significance and considers heritage as a continuing social process (Ashworth, 2011; Byrne et al., 2003; Jokilehto, 2007; Smith, 2006; Waterton & Smith, 2008). The author hopes the research can benefit the future applications of decision-making support involving heritage related dynamic problems that are expected to increase in the future.

The research seeks to find out: (1) how does the scenario forecasting play an important role in applying MCDA to selecting policy instruments in complex environmental problems? And, (2) how to use a participatory method integrated with scenario forecasting to enhance public engagement and stakeholder participation, so as to obtain adequate policy instrument, particularly for achieving multiple objectives—protecting nature, cultural heritage and society? A complex environmental problem, a heritage food production in Daxi, Taiwan, is therefore investigated, which involves conflicting stakeholders and the two aforementioned unknowns that make the environmental issue a dilemma for local government. As people might yield different views and attitudes towards the pollution issue once a traditional food production is deemed as a cultural heritage, through this case study the research also seeks to tackle the issue by exploring (3) is Daxi togan production deemed as cultural heritage by Taiwanese people? And if so, how does the recognition of cultural heritage affect the idea of the polluter-pays principle in selecting policy instruments? It is expected the findings will also help underline the social significance of cultural heritage in both heritage and environmental studies, as well as the significance of the ‘context’ of the matrix approach in decision-making towards changes.

7.2 Materials and Methods

7.2.1 Case Study—Daxi Togan

Daxi is a district in eastern Taoyuan City in northern Taiwan (Figure 7-1), voted by Taiwanese people as the best small tourist town of Taiwan in 2012. The town is popular for abundant cultural heritage and scenic spots. The cultural heritage features the diversity of early modern history in Taiwan, encompassing Taiwanese Plains Indigenous Peoples, Taiwanese people, (i.e., Han Chinese immigrated from China in 18th century) and Japanese colonialism (between 1895 and 1945 Taiwan was under Japanese rule) (Figure 7-2); geographically, it represents the earliest history of the Han Chinese migrating to the upstream area of the Tamsui River catchment (the Dahan River). Mausoleums of the two most famous presidents, Chiang Kai-shek and Chiang Ching-Kuo, (Cihu Mausoleum and Touliao Mausoleum) are located here, as both presidents considered this place significant. The town covers the upstream part of the Dahan River. There are two water resource conservation areas—Shihmen Reservoir and Bansin. Shihmen Reservoir was built upstream at southern Daxi in 1964, the biggest in East Asia, considered the most important catchment in Taiwan at the time.

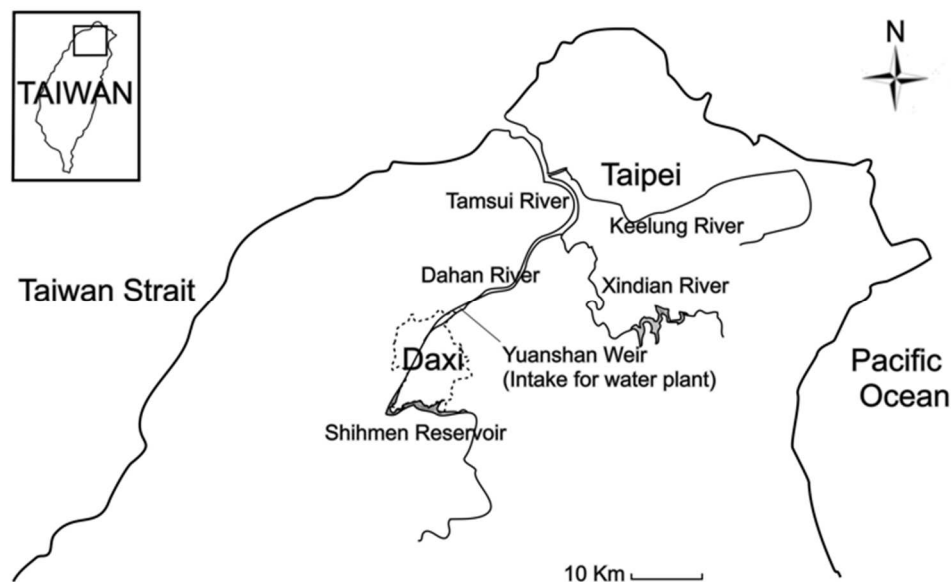


Figure 7-1. The map of Daxi and the Dahan River. Source: Author.



Figure 7-2. Cultural heritages of Daxi. *Source:* Based on Wikimedia ‘Daxi’. *Legend:* upper left shows the Daxi Old Street; lower left shows the street in Japanese colony period; upper middle shows the Lee Teng-fan's Ancient Residence; lower middle shows Japanese historical architecture Daxi Wude Hall; upper right shows Daxi Furen Temple; lower right shows Daxi Zhaiming Temple.

The focus of this research is another important contributor to heritage and popularity, namely the production of togan (i.e., dried tofu, Figure 7-3). Togan, a traditional food of the Tang Dynasty Han Chinese, dating back over 1200 years, is cultivated by coagulating soy milk and pressing the resulting curds into firm, dry blocks; water plays a key role in production. Not every traditional food is considered cultural heritage; only when it is considered significant towards the development of a given place and represents a special interaction between human and environment. Only a few togan productions in the areas of the Han Chinese are considered cultural heritage. Most of them share the benefit of outstanding spring water. The production of togan in an area with outstanding water and historical link represents a specific lifestyle of people who have adapted to particular environmental conditions and made use of these to make a living. Daxi togan's unique recipe also increased preservability, an advantage in a time without refrigeration. Development of the Daxi togan industry reflects the history of the Han Chinese immigration to an indigenous area, which subsequently developed into the trade centre of the Dahan River in the Japanese colonial period. Therefore, Daxi togan is considered as cultural heritage by Taiwanese people and has become an important industry in Taoyuan City. Sales of Daxi togan are estimated in excess of 330 million US dollar per year ("The transformation of the Daxi togan industry: More than 10 billion annual sales value," 2007) (all original estimates are converted into US dollars using the following exchange rates (April

2018): 1 USD = 29.5 TWD, with no adjustment for economic growth) .



Figure 7-3. Typical Daxi togan (right) and togan made as a snack (left). *Source:* Author.

Water and soybean are the two main materials for making togan. The production of 1 kg togan produces approximately 3.25 kg wastewater. The disposed liquid is similar to soymilk, basically edible and nontoxic but a large amount of untreated waste liquid can cause serious water pollution. Pollution caused by production of Daxi togan is the environmental issue this research intends to tackle.

Togan began as a food made at home, for home consumption. Over the last century, a few Daxi families began to sell it. During Japanese rule, construction of traffic and irrigation infrastructures facilitated the development of industries here, consequently more families became manufacturers of togan. It was the agricultural era, most people lived near waterways, it was natural for them to use superior spring water to produce togan at their homesteads. Without a concept of pollution, wastewaters returned to the water system untreated. Production was small scale, so contamination was negligible. However, the establishment of Cihu Mausoleum (1975) and Shihmen Reservoir, boosted tourism in Daxi, spreading the reputation of Daxi togan, leading to increased production and waste.

As togan sales rose, the associated pollution increasingly concerned local government. An intake for water treatment plants at Yuanshan Weir is only 2.5 km downstream of affected waterways. In December 2017, a backup reservoir started to operate only several hundred metres downstream of the polluted waterways. This reservoir supplies clean water to water treatment plants when torrential rain causes serious soil erosion in upstream Shihmen Reservoir, making the water too turbid to use (Montgomery, Huang, & Huang, 2014); revealing that there are a variety of ways of directly or indirectly affecting the sustainability of cultural heritage by climate change. Risk of taking polluted water into the backup reservoir has made this issue increasingly urgent.

There was historical background to non-intentional pollution caused by togan production in Daxi. Under statutory requirement in recent decades, to protect water for agricultural use, factories are no longer permitted to be set up by water sources. Generally, only large enterprises can afford the cost of wastewater treatment and there are no laws or regulations established for homebased businesses, so no requirement exists to control and manage wastewater discharge from unregistered togan factories. Unregistered kitchens are commonly disguised as homesteads. Conducting business in a grey area of statutory requirement has become normalised in the Daxi togan industry; reflecting conflicts between activities of cultural heritage, modern land use, modern statutory requirement and nature. Considering that togan production is recognised as a cultural heritage and the difficulties of production being legal in accordance with current laws, the local government does not want to ban or remove unregistered factories as they would to deal with other industrial polluters. How to tackle pollution without harming the togan industry has vexed local government.

National law prevents legalising existing unregistered togan factories without relocation. It is unacceptable to establish a new law, national or local, such as a home-business regulation for legalising existing unregistered togan factories without relocation, in order to demand wastewater treatment.

Treating the polluted water through the sewer system is not the answer either. Firstly, the coverage rate of the sewerage system is rather low (40.6% in urban planning areas, 0% in non-urban planning areas) as it is still under construction. Secondly, more than half of togan factories are located in non-urban planning areas (e.g., farmland, woodland), where the sewer system is inaccessible. This situation has forced the local government to apply engineering means to intercept and purify the polluted streams; however, the treatment rate remains low. Contaminated waterways contain two main types of point source pollution: domestic wastewater and togan waste liquid. The local government currently uses low-cost treatment that treats low pollution domestic wastewater as the public may consider the high-cost treatment to remove industrial waste an illegitimate public expense. The government does not want to risk investment before it ascertains if the public is willing to pay and if so, how much they are willing to pay, to help with this problem.

The solution is likely to lie between the polluter-pays and government-pays principles, meaning the polluter will still pay costs to some extent, implying some adverse impacts to the industry. Therefore, aside from the challenges and unknowns aforementioned, impacts of possible policy instruments need to be previewed and estimated. These unknowns will be dealt

with by the economic valuation method as scenario forecasting in the MCDA proposed in the latter section.

7.2.2 Pollution Investigation and the Proposal of Solutions

The concern of the untreated togan wastewater in Daxi is that it pollutes some rain drainage/spring waterways that flow into the section of Dahan River where is designated as the Bansin water resource conservation area. There are two main intake demands in the Bansin water resource conservation area; one is the demand for the emergency backup reservoir (named Zhongzhuang adjustment reservoir), not far downstream from the polluted drainage waterways; the other is the daily intake demand for water plants further downstream. There are primarily seven rain drainage waterways connecting to the Dahan River of the Bansin conservation area, namely Datiekeng creek (DTK as abbreviation in the chapter), Neizha drainage (NZ), Shimen lower drainage (SM), Yuanshulin drainage (YSL), Daxi drainage (DX), Caoling creek (CL), and Puding drainage (PD). Figure 7-4 shows the location of the waterways and the intakes.

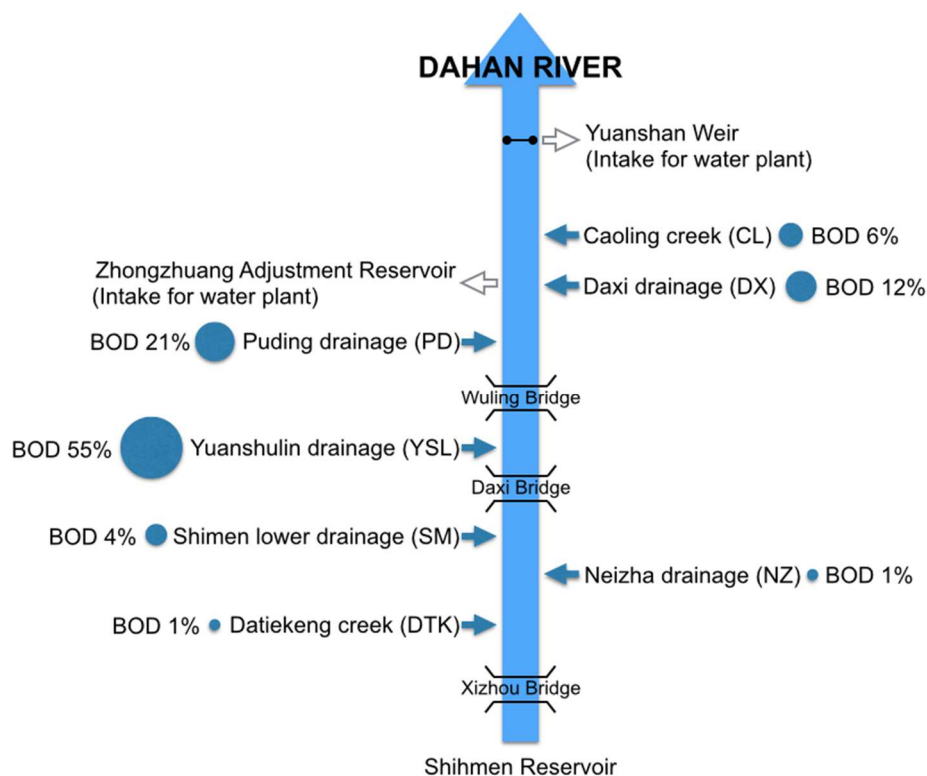


Figure 7-4. The relative locations of the seven waterways and the intake demands in Bansin water resource conservation area.

The local government has investigated the pollution level of these drainage waterways in order to improve the water resource in Bansin conservation area. According to the investigation report (AECOM, 2012), showing in Table 7-1, there are mainly three drainage waterways with unusual high pollution level, namely Yuanshulin drainage (YSL), Daxi drainage (DX), and Puding drainage (PD). The field investigation also identified the location of the point source pollutions (i.e. the togan factories), indicating that the main cause of the high pollution level of these three waterways is togan wastewater. In Table 7-1, BOD concentration can be obtained by the calculation of flow rate and BOD quantity, in order to check the rationality and representativeness of these two pollution investigations. It can be noticed that the numbers of YSL of the two-time investigations are apparently too high to be regarded as daily average, which are actually the pollution level when the togan factories are discharging. As we predict the pollution level of the waterways that are mainly polluted by togan wastewater (i.e. domestic wastewater is relatively much cleaner) should fluctuate during a day, which reflects the operation time of the manufacture, the BOD quantity of a day will be overestimated with a relatively high (i.e. peak) BOD concentration used for accumulating for 24 hours. Therefore, in order to obtain a more rational and representative volume for YSL, another two-days intensive investigation was conducted by the author of this research at YSL with four-hour intervals, the results are showed as Table 7-2 (MWH, 2013). From the BOD concentrations, it can be seen the BOD concentration fluctuates in accordance with the operation time during a day. The BOD quantity of a day at YSL should be calculated by using the concentrations of different times in Table 7-2; the results of YSL obtained are then used to replace the average of the investigations of two times from Table 7-1 to make Table 7-3, so that Table 7-3 looks more rational and hence is appropriate to be used as the basis for further analysis. Table 7-4, from the same report as Table 7-1 (AECOM, 2012), is showed here for double-checking the rationality and representativeness of Table 7-3. Table 7-4 is estimated on the basis of population in these areas, and only indicating the pollution level merely caused by domestic wastewater. Notwithstanding this table cannot be used as the representative of the current pollution level of these waterways due to the focus on the pollution of domestic wastewater, and generally this kind of estimation for domestic wastewater would be overestimated to some extent, the comparison of Table 7-3 and Table 7-4 shows that only the result of the sampling at YSL, DX and PD are apparently much higher than the estimation of domestic wastewater, reflecting the fact of pollution from togan manufacture. The comparison matches the finding from the field investigation; it also manifests the representative of Table 7-3 for further

analysis.

From Table 7-3, it can be seen that YSL, DX and PD respectively accounts for 55%, 12.2%, and 21.3% of the total pollution; and these three waterways account for 88.5% of the total pollution (Figure 7-4). There is hence no doubt considering the three waterways as top priorities and efficient targets to be deal, which is considered as the fundamental strategy to propose feasible solutions/alternatives.

Table 7-1. The two-time pollution investigations/samplings of the main drainages in the Bansin water resource conservation area.

First time				
Item	Drainage Name	Flow rate (cmd)	BOD quantity (kg/day)	BOD concentration (mg/L)
1	Datiekeng creek (DTK)	9,648	19	2.0
2	Neizha drainage (NZ)	1,930	4	2.1
3	Shimen lower drainage (SM)	59,963	124	2.1
4	Yuanshulin drainage (YSL)	45,634	12,275	269.0*
5	Daxi drainage (DX)	44,611	729	16.3
6	Caoling creek (CL)	92,621	185	2.0
7	Puding drainage (PD)	39,974	2,201	55.1
Second time				
Item	Drainage Name	Flow rate (cmd)	BOD quantity (kg/day)	BOD concentration (mg/L)
1	Datiekeng creek (DTK)	7,344	126	17.2
2	Neizha drainage (NZ)	2,088	51	24.4
3	Shimen lower drainage (SM)	46,820	472	10.1
4	Yuanshulin drainage (YSL)	28,051	7,237	258.0*
5	Daxi drainage (DX)	35,653	1,140	32.0
6	Caoling creek (CL)	67,853	753	11.1
7	Puding drainage (PD)	35,323	1,055	29.9

* These two values are apparently at the peak pollution level, which is not appropriate to be used to obtain daily BOD quantity by accumulating for 24 hours.

Table 7-2. The intensive pollution investigation/sampling of two days of the Yuanshulin drainage (YSL).

First day (weekend)				
Date	Time	Flow rate (cmd)	BOD concentration (mg/L)	BOD quantity (kg/day)
3 Aug 2013	10:00	34,741	243.0	1,407
3 Aug 2013	14:00	40,288	320.0	2,149
3 Aug 2013	18:00	42,664	318.0	2,261
3 Aug 2013	22:00	34,577	28.1	162
4 Aug 2013	02:00	27,035	22.5	101
4 Aug 2013	06:00	31,450	8.8	46
Average		35,126	174.4	
Total				6,126
Second day (weekday)				
Date	Time	Flow rate (cmd)	BOD concentration (mg/L)	BOD quantity (kg/day)
16 Aug 2013	00:00	15,725	35.4	93
16 Aug 2013	04:00	15,603	36.4	95
16 Aug 2013	08:00	16,969	272.0	769
16 Aug 2013	12:00	17,487	264.0	769
16 Aug 2013	16:00	42,958	72.8	521
16 Aug 2013	20:00	23,440	18.4	72
Average		22,030	105.3	
Total				2,319
Two days average		28,578	147.8	4,223

Note: The sampling and laboratory testing of water quality were implemented by SGS Taiwan Ltd., with the testing method of NIEA W510.55B (MWH, 2013).

Table 7-3. The average of the investigations/samplings of the two times from Table 7-1, only item No.4 Yuanshulin drainage (YSL) volumes replaced by the results of Table 7-2.

Item	Drainage Name	Flow rate (cmd)	BOD quantity (kg/day)	BOD concentration (mg/L)
1	Datiekeng creek (DTK)	8,496	73	8.5
2	Neizha drainage (NZ)	2,009	28	13.7
3	Shimen lower drainage (SM)	53,392	298	5.6
4*	Yuanshulin drainage (YSL)	28,578	4,223	147.8
5	Daxi drainage (DX)	40,132	935	23.3
6	Caoling creek (CL)	80,237	469	5.8
7	Puding drainage (PD)	37,649	1,628	43.2
Total			7,652	

* These three values are replaced by the two days average of Table 7-2.

Table 7-4. The estimation of the domestic point source pollution of the main drainages in the Bansin water resource conservation area.

Item	Drainage Name	BOD quantity (kg/day)
1	Datiekeng creek (DTK)	229
2	Neizha drainage (NZ)	525
3	Shimen lower drainage (SM)	272
4	Yuanshulin drainage (YSL)	1,255
5	Daxi drainage (DX)	834
6	Caoling creek (CL)	546
7	Puding drainage (PD)	1,379
Total		5,040

As aforementioned in the last section, the possible measures that one can think of to deal with the pollution caused by Daxi togan wastewater are basically three measures. One is to intercept and treat the polluted water from the target drainage waterways before the polluted water flowing into the Dahan River; another is to make the illegal factories become legal so that they treat wastewater under obligation; the other is to ban the illegal operation and wastewater discharge of the illegal factories. A solution plan can be made of either single measure or multiply measures. However, these three measures have different challenges and risk, and they inevitably involve the public, the consumers, and the industry. The first measure involves the most extent of the social justice of resource allocation. It is politically risky if the government ignores whether the public/taxpayers support this measure and how much the public supports it. The second measure can also involve the public if the government intends to provide subsidy to encourage illegal manufacturers to become legal, instead of merely providing some other nonmonetary benefits. The issue about how much monetary support the public/taxpayers allow the government to give is the same concern as the first measure. Whilst the third measure does not involve the issue of resource allocation, the financial burden of making the thing right after the ban of the illegal factories, including legalising the banned factory, improving the treatment facility, and the cost of treating wastewater, will completely fall on the manufacturers. The increased costs will definitely reflect on the sales price; and the higher sale price will lead to the loss of the market. Therefore, it is also necessary to acquire some necessary information from consumers/market in order to predict and assess the impact of the measure on the togan industry, for the reference of proposing solution plans and eliciting criteria performances.

This research hence proposes four possible solution plans employing the three measures for further applying MCDA method proposed, which are also for government reference. The

first plan is to intercept and treat the polluted water from the target drainage waterways to an extent that under the amount of cost the taxpayers allow the government to spend, which means the togan pollution can only be treated partly, depending on the extent of the support of the public. The second plan is also to intercept and treat the polluted water from the target drainage waterways to an extent, whilst this plan aims to treat as much as the pollution of togan manufacture merely from environment concern, without considering the opinion or consensus of the public. The third plan, which consists of the second and the third measure, is to ban illegal factories and provide subsidy to help the illegal manufacturers become legal. Similarly, the subsidy is as the same issue of resource allocation as the first plan, which also depends on the extent of the support of the public. The fourth plan is only to ban illegal factories; the government will spend almost nothing in terms of monetary resource, whilst it will lead to the worst difficulty to the illegal manufacturers to transform and recover. The parameters used are listed in Table 7-5, for calculating/assessing the quantitative criteria performances of MCDA table in the section 7.3.

Table 7-5. The parameters used for calculating/assessing the quantitative criteria performances of MCDA table.

Item	Parameter and description	Quantity (unit)	Source
1	Total BOD pollution untreated from the 7 waterways	7,652 (kg/day)	Table 7-3
2	Construction cost for basic secondary sewage treatment	10,000 (TWD/CMD), 338.9 (USD/CMD)	Investigated from market price
3	Operation cost for basic secondary sewage treatment	2 (TWD/M ³), 0.068 (USD/M ³)	Investigated from market price
4	Construction cost for advanced secondary sewage treatment	35,000 (TWD/CMD), 1186.4 (USD/CMD)	Investigated from market price
5	Operation cost for advanced secondary sewage treatment	8 (TWD/M ³), 0.169 (USD/M ³)	Investigated from market price
6	Daxi togan annual sale value	10,000,000,000 (TWD), 338,983,050 (USD)	(Epoch Times, April 4, 2007)
7	Daxi togan unit price	120 (TWD/kg), 4.068 (USD/kg)	Investigated from market price
8	Daxi togan annual sale volume	83,333,333 kg	Derived from item 6 and 7
9	Cost of wastewater treatment per kg togan	2.5 (TWD), 0.085 (USD)	Derived from market price investigation
10	Cost of legalisation per kg togan	9.1 (TWD), 0.308 (USD)	Derived from market price investigation

Before the main processes of MCDA are conducted, including scoring, weighting, and ranking, there are some essential information needs to be acquired as aforementioned. Table 7-6 lists the foregoing four plans, with adding the status quo (i.e. doing nothing) as a plan, for the purpose that assures the preferred alternatives of MCDA are better than the status quo. The

table shows the additional information needed, which can be acquired from the public through the economic valuation method. For the Plan B and D, the maximum amount of money the public allows government to spend in executing the plan needs to be acquired beforehand. Otherwise, the planners will not be able to propose the specified plans, including how much money the plan can spend, how much pollution will be treated, and which waterway to be treated. Whilst for the Plan D and E, the relation between togan price and sales needs to be acquired, due to the change of the price reflected by the financial burden of legalisation, so that the sales volume can be used as a MCDA criterion, and the scores of this criterion can be objectively assessed and derived according to the information. Some more details of these five plans, as well as how to integrate the economic valuation method with MCDA will be discussed in the latter sections.

Table 7-6. The proposal of the alternatives for MCDA, and the additional information needed.

Item	Plan	Description	Additional information needed
A	Status quo	Do nothing	
B	Wastewater treatment	Intercept and treat wastewater from the waterways, under the financial limitation (WPT) from the public	Willing to pay (WPT) from the taxpayers
C	Wastewater treatment to a high degree	Intercept and treat wastewater from the waterways, treating as much pollution as possible, without considering the opinion from the public	
D	Ban illegal, and provide subsidy to legalisation	Ban illegal factories, whilst providing subsidy to the legalisation of manufacturers, under the financial limitation (WPT) from the public. The main extra cost for legalising manufacturers is the wastewater treatment cost.	1) Willing to pay (WPT) from the taxpayers 2) Volume and Price Relation
E	Ban illegal	Ban illegal factories. The main extra costs for the legalising manufacturers are the wastewater treatment cost and the legalisation cost.	Volume and Price Relation

7.2.3 Study Design

The MCDA method proposed in this research mainly applies the Weighted Sum Model (WSM). It is the most understandable and transparent model in MCDA, particularly suitable for tackling decision-making problems involving conflicting stakeholders in terms of transparency and deliberation, as is the case in this research. The preference P_i of alternative A_i ($i = 1, 2, 3, \dots, M$) is calculated according to the following equation (Fishburn, 1967):

$$P_i = \sum_{j=1}^N a_{ij} w_j, \quad \text{for } i = 1, 2, 3, \dots, M. \quad (1)$$

Therefore, the best alternative is the one with the largest preference value. However, the scores (i.e., a_{ij}) must be numerical and standardised. Furthermore, the logical distribution of the weights (i.e., w_j , j represents individual criterion) between conflicting aspects (e.g., heritage vs. natural environment) is critical, hence a pre-weighting process is recommended later in this article.

An intervention perspective for dealing with impact assessment in heritage management has been proposed in Chapter 5; a matrix perspective highlighting a comprehensive consideration towards intervention recipient ensemble—heritage, context and nature, with three assessment aspects—value, sustainability and resilience (Figure 7-5). The intervention perspective provides a more comprehensive and inclusive way of thinking regarding impact assessment, as the current practice has a tendency of focusing on physical preservation; at most, consideration extends to the surroundings of the heritage (usually the aesthetic aspect of the setting) (Ashworth, 2011; Byrne et al., 2003; Jokilehto, 2007; Smith, 2006; Waterton & Smith, 2008), ignoring that natural environment is an interdependent part of heritage ensemble. The values-based perspective is dominant in heritage conservation, solely using value aspect to assess intervention (Jokilehto, 2007; Walter, 2014), leading to a narrow consideration regarding impact assessment (Patiwael et al., 2018). Two additional assessment aspects, namely sustainability and resilience, are hence proposed by the author to supplement the missing spheres of assessment; sustainability enhances temporal coverage, whilst resilience enhances probability and risk management. Although it is widely accepted that sustainability includes the economic sphere, implying an overlap with value aspect in the matrix, the value and sustainability aspect referred to here have different focuses towards impact assessment. In this case, doing nothing to the pollution (Plan A) and treating the pollution by government resource (Plan B) may not cause adverse impact on cost and sales (C3), whilst the public may have different views on these two plans, such as an irresponsible loss of reputation that affects sustainability. However, the resilience proposed refers to ability to recover from destructive loss or damage due to the impact of a change (e.g., policy), no matter how small a possibility; differing from the value aspect that is based on certainty and the present time.

As can be seen from Figure 7-5 (left), heritage contains the people living within it; and context includes the community living within the setting of heritage. The proposed intervention perspective particularly underscores the importance of people and social sphere in heritage management, in line with the most notable emerging trend in heritage studies (Smith, 2006), echoing a concerning inadequacy of social impact assessment in environmental

protection (Bronstein, 1995; Vanclay, 2003). Furthermore, applying the perspective to the proposed MCDA can help communication between heritage practitioners and other professionals (e.g., environmentalists), so as to help different stakeholders identify important impacts as assessment criteria. The author hence transforms the matrix into the value tree of MCDA, along with another important point—adding cost and benefit to the value aspects—for preventing ignorance of benefit/utility respect in MCDA application (Figure 7-6). The value tree proposed can therefore be applied as a framework particularly suitable for environmental problems involving cultural heritage and nature. It is also notable that the aim of the MCDA case is to achieve a ‘harmonious environment,’ protecting the natural environment whilst maintaining an advantageous societal environment for cultural heritage to survive and sustain.

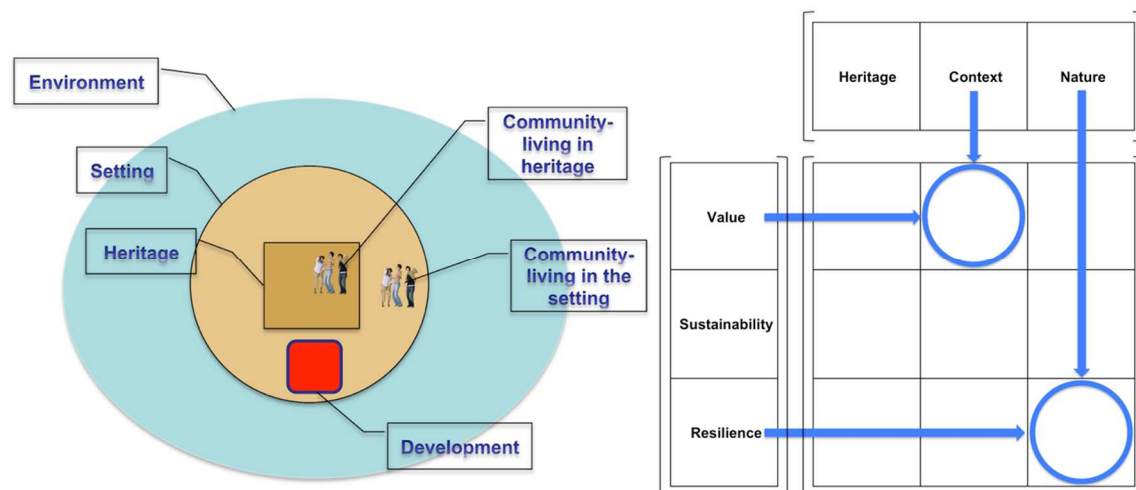


Figure 7-5. The intervention matrix perspective proposed by the author in Chapter 5.

As for proposing the plans/alternatives of MCDA, a systematic assessment regarding possible policy instruments is necessary; an advantageous process for proposing solutions in governance (Le Galès, 2011). Since the environmental problem involves a cultural heritage, not merely a traditional food production, the local government is against applying strict measures of the polluter-pays principle (Pearce, 1989), in order to avoid adverse effects to the togan industry. They are stuck for a solution because they have no idea to what extent the public will support this cultural heritage. Regardless of diversity in the classification and evaluation approach of policy instruments (details please see (Bemelmans-Videc, Rist, & Vedung, 2011; Hood & Margetts, 2007; Howlett, 1991; Jordan, Wurzel, & Zito, 2005; Lester, 2002; Linder & Peters, 1989)), it is feasible that the solution of this case lies between government-pays and polluter-pays. Based on several on-site meetings for this pollution issue,

attended by manufacturers, local representatives, experts and governors, the challenges and demands of the different stakeholders as well as the resources of the government are considered. The research hence proposes five plans, with four policy instruments, namely organisation-based, economic, regulatory and information-based instrument, as shown in Table 7-7. Each plan may be only one instrument applied, or multiple instruments applied. Four criteria are applied in the research to assess and select the policy instruments, including effectiveness, acceptability (to stakeholders and the public), economic feasibility and technical feasibility.

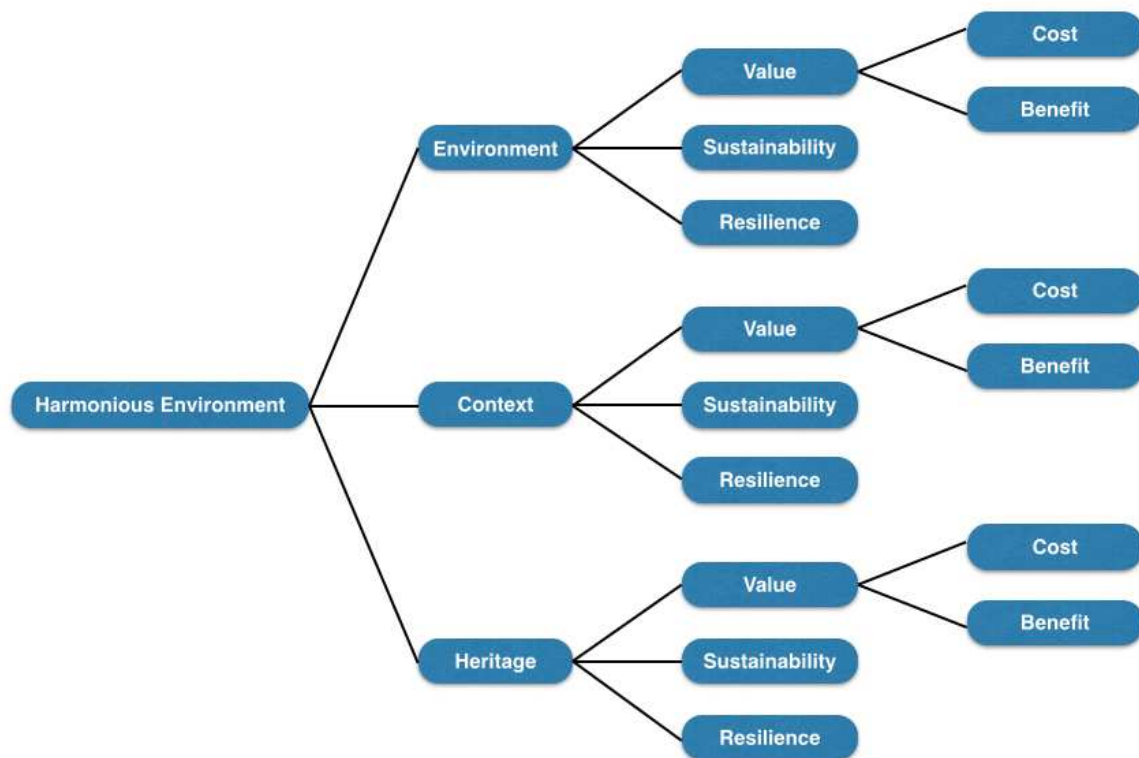


Figure 7-6. Value tree framework with the inclusive considerations transformed from the intervention perspective.

Considering the constraints of legality and historical background and that environment and heritage both are in need of protection, understandably the tools of government are limited. Plan A is the status quo (i.e., doing nothing except for moral suasion), mainly for the purpose of assuring the other four alternatives proposed are not worse than the status quo in all criteria, as unregistered factories are unlikely to be persuaded to treat the wastewater due to the cost of treatment. Plan B and Plan C are both on government-pays basis, with organisation-based policy instrument, which aims to intercept polluted water and purify it with treatment facilities

built and supported by the government. The difference is that Plan B will implement the instrument within the financial limitation—the amount the public agree the government to spend—and Plan C without considering the opinion of the public. The opinion of the public implies the togan industry is excused to some extent due to the status and background of cultural heritage. Plan C has a risk of being challenged on social justice towards resource allocation. Plan D lies between government-pays and polluter-pays basis, with economic instrument—subsidy—to encourage legalisation (i.e., relocating factories), as well as regulatory instrument—ban or fine—to prohibit pollution discharge. Once the factory is legalised, which means it is registered and monitored, the factory needs to treat wastewater at its own cost. Plan E is purely on polluter-pays basis, with only regulatory instrument—ban or fine—to prohibit pollution discharge. Without any monetary support, it is the most challenging for the manufacturers.

Table 7-7. The proposal of the alternatives for MCDA and the policy instruments applied.

	Policy Instruments Applied	Plan	Description	Scenario Forecasting Information Needed
Government-pays ↑	Organisation-based	C—Wastewater treatment to a high degree	Intercept and treat wastewater from the waterways, treating as much pollution as possible, without considering the opinion from the public.	
	Organisation-based	B—Wastewater treatment	Intercept and treat wastewater from the waterways, within the financial limitation (WPT) from the opinion of the public.	How much support — willingness to pay (WPT) by the taxpayers
	Economic & Regulatory	D—Ban illegal and provide subsidy to legalisation	Ban illegal factories, whilst providing subsidy to the legalisation of manufacturers within the financial limitation (WPT) from the public. The polluters still need to pay the cost for wastewater treatment.	1.How much support — willingness to pay (WPT) by the taxpayers 2.How much impact — sales volume and price relationship
	Information-based	A—Status quo	Do nothing except for moral suasion.	
Polluter-pays ↓	Regulatory	E—Ban illegal	Ban illegal factories. The polluters need to pay the costs of the legalisation and wastewater treatment.	How much impact — sales volume and price relationship

As can be seen from Table 7-7, there exist some unknowns that need to be solved so as to proceed MCDA; an obstacle to government in proposing possible solutions. For Plan B and D, the maximum amount of government's spend the public will allow for each plan needs to be known, otherwise the planners will not be able to propose specified plans in detail (i.e., technical); more importantly, the policy change might be unacceptable to the public, becoming

a political disaster. For Plan D and E, the relationship between togan price and sales also should be acquired, so that the sales volume can be used as a MCDA criterion. Since additional cost of treatment and legalisation will reflect on price and sales, policy change is critical to the survival of this heritage. The scores of this critical criterion can be objectively estimated by scenario forecasting.

After proposing the five alternatives (Table 7-7), the criteria of MCDA can be elicited with the framework of the value tree (i.e., Figure 7-7) according to the impact of the five plans identified by different stakeholders. It can prevent blindness and bias of different stakeholders with regard to selecting criteria, particularly in conflicting circumstances. Moreover, as the future can never really be predicted, applying the intervention perspective helps to narrow down notable impacts (i.e., as criteria) of interventions (i.e., plans) to carry out scenario forecasting. Amongst the important impacts, there are six selected as the criteria; C1-Cost refers to the amount of money the government needs to spend on the given plan; C2-BOD refers to the pollution level after the given plan is implemented; C3-Sales refers to sales of Daxi's togan after the given plan is implemented; C4-Employment refers to the employment condition of local people; C5-Heritage Sustainability refers to sustainability of the heritage and heritage community; C6-Heritage Resilience refers to the ability of the heritage and heritage community to recover from a destructive loss (i.e., sales, reputation) due to the impact of the policy. The scoring of C1 and C3 relies on the scenario forecasting—the contingent valuation method (CVM); the scoring of C2 relies on the scores of C1 (i.e., budgets) to estimate the pollution level by planners from the technical details decided; the scoring of C4, C5 and C6 relies on the deliberation of stakeholders and experts to reflect the impacts of the plans, which is set to be scored from 0 to 10.

After constructing the value tree with criteria, the next step of pre-weighting is suggested, as shown in Figure 7-7, as the proposed MCDA is prone to face biased criteria distribution pattern; a pre-weighting can effectively mitigate this issue. Stakeholders often end up eliciting a value tree with unbalanced criteria distribution in conflicting objectives, meaning the weights are not logically assigned. In this case (Figure 7-7), since there are three criteria (C3, C5, C6) relating to heritage whilst there is only one criterion relating to environment (C2), without pre-weighting to obtain logical weights the result is prone to bias towards plans that benefit heritage-side stakeholders. The rules of pre-weighting include, start from left of the branches to the right to distribute weights; the first level of branches sum up in one and so do the last; the weights of each level are decided under the deliberation of stakeholders with the support of

experts to obtain a logical distribution according to the condition of the given case. This pre-weighting process can effectively help stakeholders obtain an essential idea of relative importance between criteria before the influence of knowing the scores, so as to elicit logical formal weights after scoring. Even if a set of formal weights given by a stakeholder at a later stage are very different from the pre-weighting set of weights, the stakeholder then will be able to explain it to other conflicting stakeholders rather than utilising intuitive judgement or the intention to affect ranking. Furthermore, with the reference of pre-weighting, swing weights technique or other pairwise comparison methods can be applied if there are numerous criteria needing to be weighted.

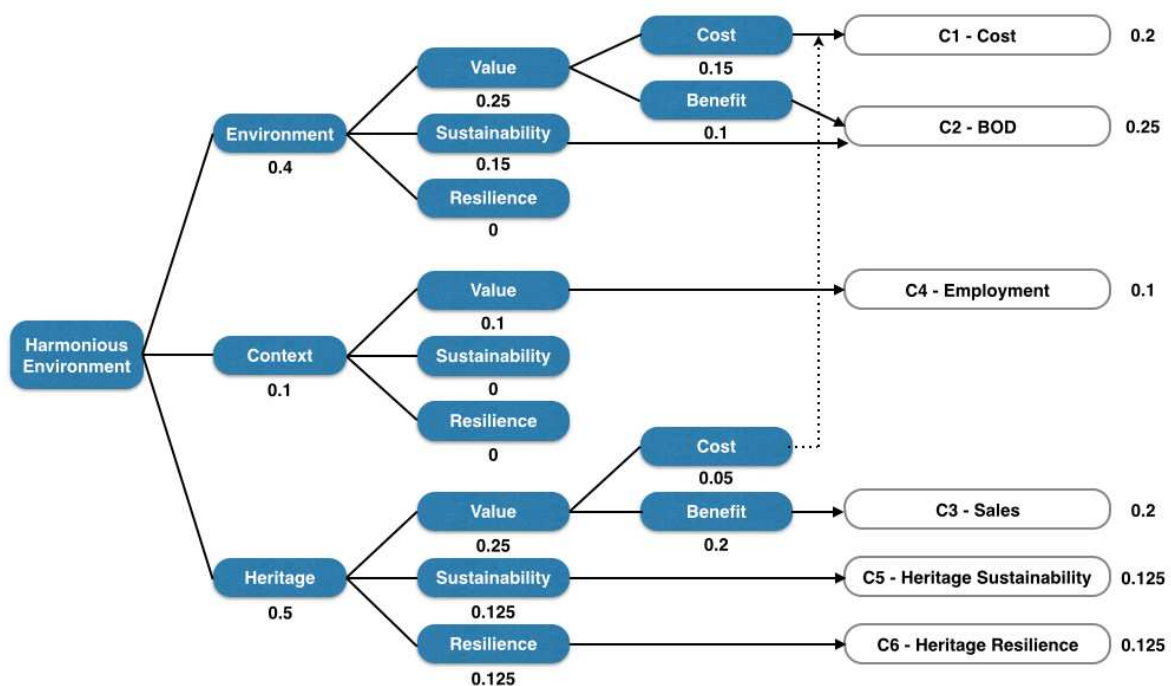


Figure 7-7. The criteria elicited and the pre-weighting. Legend: It must be noted that a criterion can consist of different sub-attributes (e.g., C1, C2), meaning the trade-off relation can exist at any level (e.g., C1: between heritage and environment; C2: between value, sustainability and resilience).

The monetary value of environmental changes can be assessed by eliciting the public's preferences for non-marketed goods without market price through a range of economic valuation methods. The stated preference methods (e.g., contingent valuation, choice experiment) employ the survey technique to elicit preferences and valuations from the general public (Bateman et al., 2002). Due to the nature of this environmental problem, this research applies the contingent valuation method (CVM) for scenario forecasting, with payment card method as the elicitation format. Payment card format uses an ordered set of threshold values

that respondents are asked to peruse and indicate the highest amount they are willing to pay. There are other elicitation formats. Since every format is subject to some degree of bias (for details of other formats please see (Bateman et al., 2002; Boyle, 2003; Johnston et al., 2017)), the advantages of selecting payment card method include avoidance of a non-response situation in open-ended (i.e., ‘name the amount’) format, avoidance of starting point bias (Belton & Stewart, 2002; Mitchell & Carson, 2013), reduction of the number of outliers and respondents’ effort (Bateman et al., 2002; Cameron & Huppert, 1989). Another important character is that the WTP estimates of the format are generally more conservative than those generated by other formats (Champ & Bishop, 2006; Hackl & Pruckner, 1999; Thur, 2010), which is most appropriate for this case with its budgetary considerations.

A CVM survey for scenario forecasting was conducted in April 2018 in Taiwan, following the demands in Table 7-7, for deriving (1) willingness to pay (WTP) to support cultural heritage and (2) the relationship between sales and price for estimating impact on industry. When a respondent selects a certain bid on the payment card, their true WTP will be between that number and the next number up. It means the intervals must be fine enough to obtain an accurate estimation, whilst also coarse enough to facilitate each respondent to decide which interval contains their actual willingness to pay (Boyle, 1998; Cameron & Huppert, 1989). Therefore, before the formal survey, a pre-test survey was conducted to test the bid range and understandability of the questionnaire. The final version of the questionnaire clearly defines income taxes as the payment vehicle for households, the timing of payment is defined as a yearly payment for five continuous years. The questionnaire is translated into English (originally in Chinese) and shown in Appendix A.

For the method to calculate the WTP, the study applies a midpoint approach, which is based on Turnbull’s lower bound mean estimate of WTP (Blaine, Lichtkoppler, Jones, & Zondag, 2005; Turnbull, 1976). The lower bound mean (LBM) approach appeals to many policy makers as its estimates are more conservative and straightforward, this is calculated as follows:

$$LBM = \pi_0(p_0) + \sum_{i=1}^k \pi_i(p_i - p_{i-1}) \quad (2)$$

where the π_i are percentages who are willing to pay a given amount p_i ; the initial bid is p_0 and k is the number of bids offered after the initial bid p_0 . Instead of using lower bound, we use the midpoint of each interval. According to Kristrom (Blaine et al., 2005; Kriström, 1990), this adaption should be able to get a more realistic estimate, as follows:

$$\begin{aligned}
 \text{Midpoint Mean} = & \text{LBM} + \frac{1}{2}p_0(1 - \pi_0) \\
 & + \sum_{i=1}^k \frac{1}{2} |\pi_i - \pi_{i-1}|(p_i - p_{i-1}) + \pi_k(p^* - p_k)
 \end{aligned} \tag{3}$$

where p^* is the average bid price provided by the respondents who are willing to pay the maximum bid of the range or more, which is used as midpoints of other intervals for calculation because there is no interval beyond the maximum bid given by the question.

As the proposed MCDA highlights participatory features, this article summarises the critical steps regarding participants and purposes (Table 7-8). Experts play a notable role in the MCDA. At the step of value tree building they help stakeholders identify important impacts with the support of the intervention framework proposed and select appropriate ones as criteria. Through pre-weighting, experts can further understand demands and considerations of stakeholders, so that they can better represent the stakeholders to complete formal weighting in the later stage. At the scoring step, experts need to assist the stakeholders to score in C4, C5 and C6, referring to the information obtained from scenario forecasting (i.e., C1 and C3). Notwithstanding there are several interest groups involved in the case, such as heritage community (the manufacturers), local community, water resource authority, planning authority and environment agency, through the understanding from pre-weighting, the research summarises the weighting patterns into three tendencies, namely environment, heritage and planning, each represented by at least one expert through the weighting process. Instead of directly reaching a set of weights through deliberation, as the pre-weighting does, the listing of the three sets of weights (Table 7-11) provides the decision maker with clearer sight of differences and provides necessary information for the sensitivity analysis process.

Table 7-8. The summary of participatory features.

Step	External Participants	Purpose
Value tree building	Stakeholders with experts	Though applying intervention perspective to identify impacts that is considered important differently by conflicting groups, to be used as criteria
Pre-weighting	Stakeholders with experts	To prevent inconsistency or illogical formal weighting after scoring
Scenario forecasting	The public/policy recipients	To provide necessary information for proposing solution plans and proceeding MCDA, as well as to deliberate the matter of resource allocation with conflicting stakeholders and the public
Scoring	Stakeholders with experts	To provide logical scores for judgemental criteria
Weighting	Experts representing stakeholders	To include opinions of conflicting groups so as to better achieve multiple objectives
Scaling	Stakeholders with experts	To show the better way of scaling with transparency to the stakeholders
Sensitivity analysis	Stakeholders with experts	To explain the selected final solution by sensitivity analysis with transparency to the stakeholders

7.3 Results

Estimation of WTP usually yields median and mean WTP. The research chooses median WTP as the scenario forecasting for the scoring of C1-cost. The WTP estimate represents the amount of money the public allows the government to spend, supporting cultural heritage to deal with pollution. The median WTP is chosen mainly for three reasons. Firstly, as WTP is to be considered as a government budget for tackling the pollution issue, implying a majority voting rule basis, the median WTP represents there being 50% of people willing to pay more (Bateman et al., 2002), which matches the voting rule. Secondly, the median WTP is usually less than the mean WTP in most cases (Bateman et al., 2002; Cameron & Huppert, 1989); a conservative estimate is appreciated from the viewpoint of governmental budget. Thirdly, the median WTP is generally less affected by other factors, such as different estimation approaches once applied (e.g., ordinary least squares (OLS) or maximum likelihood (ML), although both are not used in the research), by embedding effects (the higher WTP given because the respondent considers the price as for all conservation projects of the country) (Huei-Yann & Chien-Der, 1998) and by illogical value answers beyond the maximum threshold value.

The formal survey collected 272 effective questionnaires through an online survey platform (100% response rate). The profile of survey respondents is as follows. There were more females than males (68.7% and 31.3%, respectively). The majority (90.8%) were graduates of university and higher degrees, followed by 9.2% with qualifications from senior high school and lower degrees. The age distribution was: the majority (46.7%) were 40–49

years old, followed by 30–39 years (26.5%), 50–59 years (15.1%), 20–29 years (7.0%), more than 60 years old (4.4%) and 19 years and younger (0.4%). Average annual household income for the majority of respondents (30.5%) was NT\$500,000–1,000,000, followed by NT\$1,000,000–1,500,000 (29.4%), NT\$2,000,000 and more (18.8%), NT\$1,500,000–2,000,000 (14.3%) and NT\$0–500,000 (7%). Number of people per household for the majority (31.6%) was four members, followed by three members (21%), five members (19.9%), two members (11.4%), six members and more (11%) and only one member (5.1%). Distribution of residence was: northern Taiwan (68.4%), southern Taiwan (23.5%), central Taiwan (5.9%), eastern Taiwan (0.7%) and the others (1.5%). The estimation of WTP is shown in Table 7-9, with 95% confidence level and 5.93% confidence interval. The five-year value applying the median WTP is estimated to be 128,700,000 USD (3,797,500,000 TWD), which is applied as the maximum budget allowed in Plan B and D. The WTP estimate appears large Taiwanese people deeming Daxi togan as cultural heritage; they are willing to support the government in solving this problem.

Table 7-9. The estimation of WTP for C1-Cost in Plan B and D.

Item Name	Description	Volume
1 Number of questionnaires	Responded in total	272
2 Mean WTP/ household	Willing to pay (WTP) derived through Payment Card Method	371.3 TWD, 12.59 USD
3 Median WTP/ household	Willing to pay (WTP) derived through Payment Card Method	122.5 TWD, 4.15 USD
4 Number of households	Total households of taxpayers in Taiwan	6,200,000
5 Annual value	Apply median WTP for a conservative budget	759,500,000 TWD, 25,740,000 USD
6 5 years value	The maximum allowed budget for Plan B and D	3,797,500,000 TWD, 128,700,000 USD

Note: With 95% confidence level and 5.93% confidence interval.

The other part of scenario forecasting explores the relationship between sales and price for estimating impact of Plans D and E on the market. The second WTP (with mean WTP), also applying payment card method, is estimated so as to find the maximum acceptable price increase, as shown in Figure 7-8. The maximum increase in price consumers are willing to pay for Daxi togan is 109%. With this figure the market change (i.e., sales) caused by the implementation of Plan D and Plan E can be respectively estimated, and, more importantly, it shows that expensive prices can drastically reduce sales. Even with its superior reputation, Daxi togan cannot win against similar products if the price is uncompetitive.

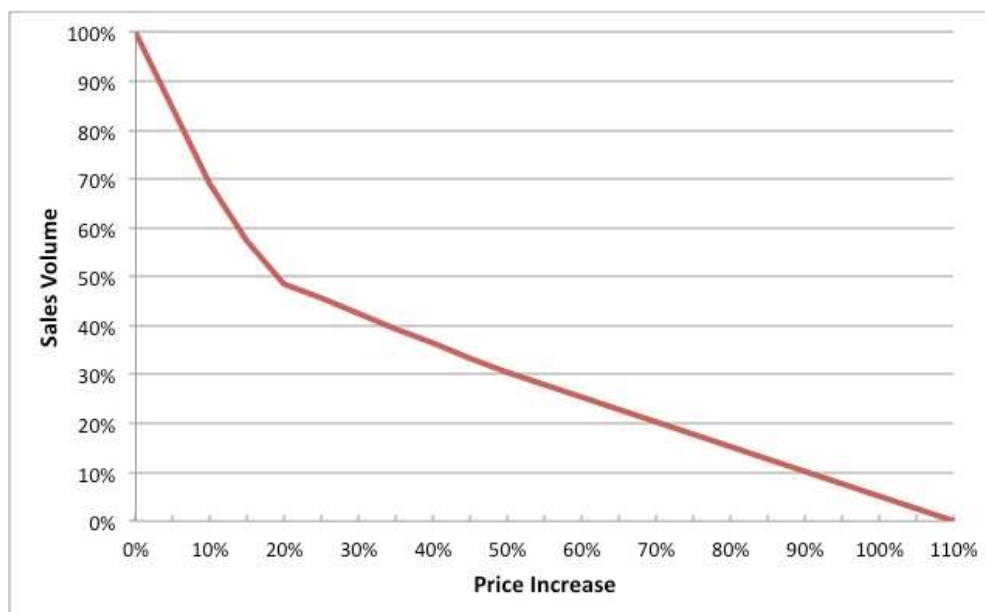


Figure 7-8. The relationship of sales volume and price, for the scoring of Plan D and E.

After the two critical unknowns are estimated, technical details of the plans can be proposed, such as which waterways to target, the amount of wastewater to treat, treatment capability and the means of economic subsidy, which means that determination of the cost of the five plans can be completed (i.e., the scores of C1 criterion). Water quality C2 can be calculated according to C1 and the technical details. With an estimation of relationship between sales and price, C3 sales can be calculated accordingly; additional costs required from the polluters form the technical details. The scores of C1, C2 and C3 are mainly worked out by the planners, becoming referential information for stakeholders and their representative experts to elicit scoring in C4, C5 and C6 (Table 7-10). The scoring of C4, C5 and C6 relies on qualitative assessment, initially set ranging from 0 to 10; the experts need to help stakeholders score them according to impacts from the proposed plans. C4-Employment may be affected by the ban of illegal factories, as well as decreases in sales. C5-Heritage Sustainability involves mostly the future loss of reputation due to efforts made by polluters. C6-Heritage Resilience represents recovery from potential loss, for instance, undesirable policy in resource allocation making consumers avoid purchase, or a changed political circumstance forcing the authority to apply legal force.

Table 7-10. Raw values/performances of the alternatives.

Plan	Brief description	Pollution Reduction (%)	C1 Cost (TWD)	C2 BOD left (Kg/day)	C3 Sales (Kg/year)	C4 Employment	C5 Heritage Sustainability	C6 Heritage Resilience
A	Status quo	0%	0	7,650	83,300,000	7	1	2
B	Wastewater treatment for only one waterway	49.7%	3,269,000,000	3,850	83,300,000	7	3	4
C	Wastewater treatment for three waterways	76.5%	4,991,000,000	1,800	83,300,000	7	3	3
D	Ban illegal and provide subsidy to legalisation	48.2%	3,797,500,000	3,950	78,000,000	6	9	8
E	Ban illegal	48.2%	10,000,000	3,950	58,400,000	3	6	4

Since Plan B is designed with consideration of the opinion of taxpayers (i.e., WTP) regarding legitimacy of resource allocation, the budget must not exceed 128,700,000 USD (3,797,500,000 TWD). Estimation of cost hence starts from the most polluted waterway—Yuanshulin drainage (YSL)—with an advanced secondary sewage treatment planned to treat 35,000 CMD polluted water. The construction cost is estimated at 1186.4 USD/CMD and the operation cost 0.169 USD/M³ (according to the average cost of sewage treatment facilities built in Taiwan), overall costs for a twenty-year operation is estimated at 3,269,000,000 TWD (110,800,000 USD), within the budget (WTP) of 3,797,500,000 TWD (128,700,000 USD).

Plan D is also designed to follow budget constraint (WTP). It proposes banning illegal factories but providing a subsidy for legalisation (9.1 TWD per kilogram of togan). Polluter would pay the cost of wastewater treatment, estimated at 2.5 TWD per kilogram of togan (0.085 USD) and assumed to reflect a 2.06% increase in price. Impact on the sales can be assessed by using Figure 7-8, calculated as 78,000,000 Kg/year in C3-Sales (see Table 7-10). As to the BOD pollution level, it is assumed that after implementation all togan wastewater in the three most polluted waterways is eliminated, any pollution left in the seven waterways would be domestic wastewater.

Plan E also involves the change of price and sales. The score of 58,400,000 Kg/year in C3-Sales (see Table 7-10) can be calculated through the sum of the cost of legalisation (9.1 TWD per kilogram of togan) and the cost of wastewater treatment (2.5 TWD per kilogram of togan), to be paid by the manufacturers. In terms of government spend, the cost of banning illegal factories is relatively negligible, a significant advantage of the plan with respect to MCDA ranking. As to the BOD pollution level after implementation, it applies the same assumption as Plan D and achieves the same BOD level.

Plan C is proposed as an environment-oriented solution, intercepting and treating polluted water without considering the opinion of the public regarding the legitimacy of resource allocation. Even without knowing the opinion of the public, it is worth consideration as

environmental concern can take precedence if pollution levels become dangerous; also, spending money can be simpler than reaching public consensus on resource allocation. Following the estimation of cost for treating the YSL waterway in Plan B, this plan also includes treatment of the second and third most polluted waterways—Puding drainage (PD) and Daxi drainage (DX)—with two basic secondary sewage treatments to treat 35,000 CMD polluted water of each waterway. Construction cost is estimated at 338.9 USD/CMD and the operation cost 0.068 USD/M³ (according to the average cost of sewage treatment facilities built in Taiwan), overall cost for the twenty-year operation is estimated to be 4,991,000,000 TWD (169,200,000 USD), which exceeds the maximum budget (from the estimation of WTP) of 3,797,500,000 TWD (128,700,000 USD). Treatment of the three most polluted waterways can reduce 76.5% BOD pollution, which is the best performance in terms of river purification amongst these five plans.

After completing the scoring (Table 7-10), the next step is weighting. Since interest groups are prone to intentionally affect the ranking result in weighting process after seeing the scores, the research suggests using experts to represent the interest/consideration of these conflicting stakeholders, so as to logically and efficiently obtain the weights, as shown in Table 7-11. This step also comprises of checking whether the set of weights are logical by comparison with the pre-weighting. Instead of scoring and weighting at the same time, such as AHP method, this method highlights the advantage of weighting after scoring, as different scoring results inevitably affect people's elicitation of the weights. For instance, if all the raw scores of C2-BOD of the five plans become only 10% of the current volume, although scores after standardisation will still be the same, the importance of C2-BOD is actually different, implying the set of weights should all be altered. In other words, in MCDA, the scale of the raw scores of criteria is critical, as the weighted sum method reflects the overall performance from the ratio relations between scores.

Table 7-11. Weighting of the three experts representing the conflicting stakeholder groups.

	C1 Cost	C2 BOD left	C3 Sales	C4 Employment	C5 Heritage Sustainability	C6 Heritage Resilience
Environment	0.18	0.31	0.16	0.06	0.15	0.14
Heritage	0.13	0.16	0.24	0.10	0.19	0.18
Planning	0.23	0.28	0.20	0.08	0.11	0.10
Mean	0.18	0.25	0.20	0.08	0.15	0.14

The next step is standardising these raw scores. The MCDA research carried out two ways of

scaling, as shown in Table 7-12. Global scaling is a linear transformation using maximum and minimum ‘possible’ values assigned for each criterion as upper and lower boundaries, whilst local scaling is a linear transformation using the maximum and minimum ‘measured’ values (i.e., scores) for each criterion as upper and lower boundaries (for details of the two methods please see (Martin & Mazzotta, 2018)). Taking C3 as an example (Table 7-10) for global scaling, the score 7650 of Plan A is the maximum possible value and will be calculated as the upper boundary 100; and the minimum possible value is 0 rather than the score 1800 of Plan C, which will be calculated as the lower boundary 0. Whilst for local scaling, the score 7650 of Plan A is the maximum measured value and will be calculated as the upper boundary 100; and the score 1800 of Plan C is the minimum measured value and will be calculated as the lower boundary 0. As to qualitative criteria, since the scoring of C4, C5 and C6 is initially set ranging from 0 to 10, which facilitates the transformation of global scaling, as the maximum (100) and minimum (0) possible values are relatively of the same scale. As different scaling methods sometimes lead to different ranking results, scaling methods must be used appropriately if the logical results are to be obtained (Martin & Mazzotta, 2018). After calculating the overall preference P_i with the Equation (1) using the set of mean weights (Table 7-11), the results of ranking from the two scaling methods show the difference (Table 7-12). The main difference in order is Plan E, which reveals that a minimum score of 0 in C3-Sales of the local scaling disproportionately represents the ratio relation of raw scores, leading to a drop from second position to fourth. Generally the local scaling performs better than the global only when most of the limitations/boundaries of the ranges happen to be the minimums and maximums of raw scores of criteria. In addition, global scaling is more appropriate for qualitative criteria due to the consistency between raw scores and standardised scores, as in the aforementioned example, where the local scaling apparently results in distortion. Therefore, the research intends to make the point that the selection of scaling method depends on the nature of the case given and it should be transparent to stakeholder participation in the MCDA proposed.

Table 7-12. Standardised scores of the alternatives (the more the better), with global scaling and local scaling.

Global scaling								
Plan	C1 Cost	C2 BOD left	C3 Sales	C4 Employment	C5 Heritage Sustainability	C6 Heritage Resilience	Overall Value	Ranking
A	100.00	0.00	100.00	70.00	10.00	20.00	47.90	5
B	45.52	49.66	100.00	70.00	30.00	40.00	56.31	4
C	16.82	76.45	100.00	70.00	30.00	30.00	56.44	3
D	36.71	48.22	93.61	60.00	90.00	80.00	66.89	1
E	99.83	48.22	70.05	30.00	60.00	40.00	61.04	2
Local scaling								
Plan	C1 Cost	C2 BOD left	C3 Sales	C4 Employment	C5 Heritage Sustainability	C6 Heritage Resilience	Overall Value	Ranking
A	100.00	0.00	100.00	100.00	0.00	0.00	46.00	5
B	34.50	64.96	100.00	100.00	25.00	33.33	58.87	3
C	0.00	100.00	100.00	100.00	25.00	16.67	59.08	2
D	23.91	63.07	78.67	75.00	100.00	100.00	70.81	1
E	99.80	63.07	0.00	0.00	62.50	33.33	47.77	4

The final result that applies global scaling from Table 7-12 is shown as Figures 7-9 and 7-10. Generally speaking, the top rank is Plan D, followed by Plan E; the order between Plan B and Plan C are relatively sensitive and unstable; Plan A (i.e., status quo) robustly places last. A different order can be seen from the ranking of the planning expert, with a relatively high weight of 0.23 of C1-Cost (Table 7-11), that Plan E outranks Plan D due to having outstanding performance in cost and that Plan B outranks Plan C for the same reason. It reveals that the decision-maker should notice the possibility of order changing for instance if the government faces high financial pressure. Consequently, we conduct a sensitivity analysis targeting this critical criterion, as shown in Table 7-11 and Figure 7-11, if the applied weight of C1-Cost is raised (currently 0.18, see Table 7-11), with the rest of the criteria lowered proportionately, Plan D will only remain at the top rank until approximately 0.24 and then be outranked by Plan E, which reveals the sensitive character of the cost criterion amongst the alternatives.

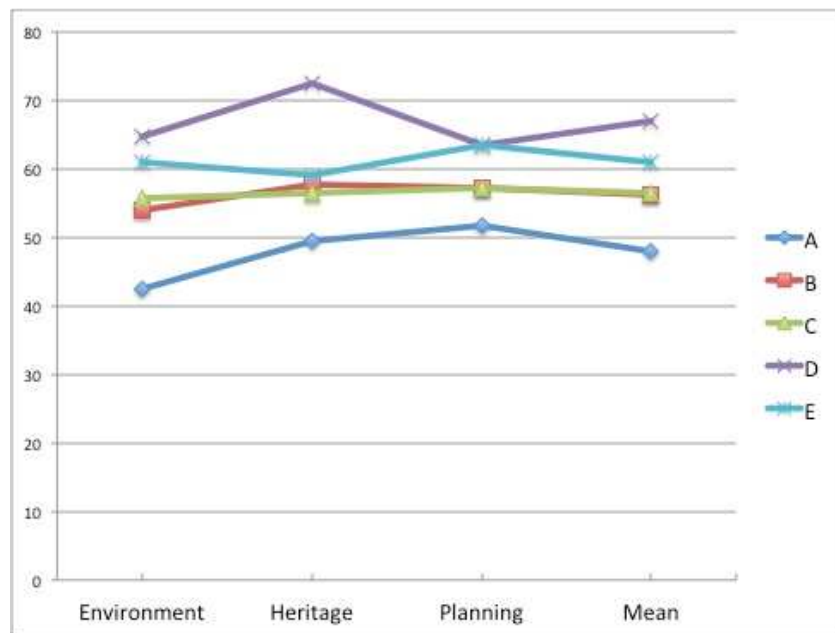


Figure 7-9. Overall preference of the alternatives from the three experts.

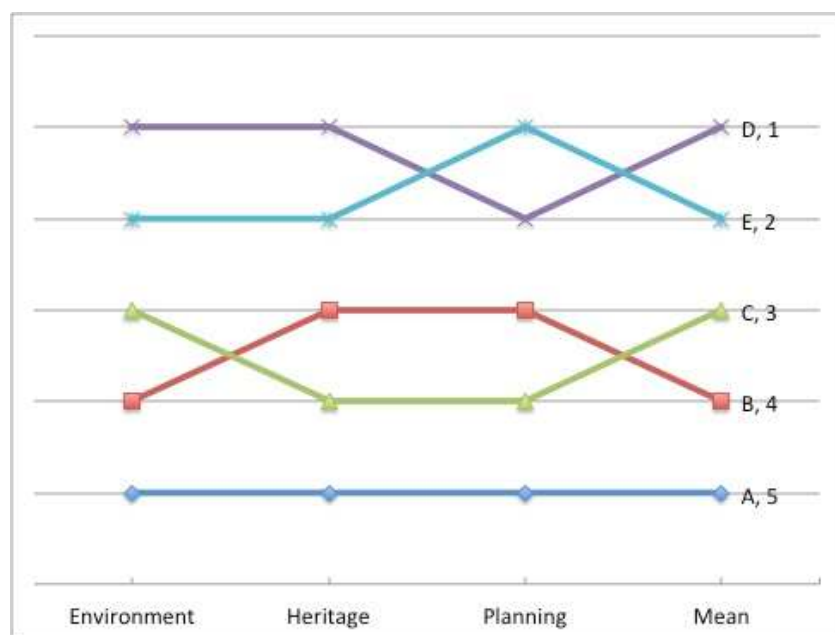


Figure 7-10. Overall ranking order of the alternatives from the three experts.

As the pollution level of the seven waterways will increase with the development of the togan industry, the later a resolution is found and implemented, the worse the situation will become. This suggests that the weight of criterion regarding environment would very likely be higher in the future. Therefore, another sensitivity analysis is carried out, as shown in Figure 7-12; if the weight of C2-BOD is raised (current 0.25, see Table 7-11), with the rest of the criteria lowered

proportionately, Plan D will hold top rank until approximately 0.45 and then be outranked by Plan C, which reveals the robustness of the environment criterion amongst the alternatives. These two sensitivity analyses provide the decision maker with the important information that Plan D is robust at the top rank in terms of criteria weights; and the government do not need to worry about the possibility of order changing regarding the environment criterion but financial circumstances can cause change.

Since the information shows C1-Cost can affect Plan D's top ranking, there is a requirement to see if Plan D can be improved. The research wants to know whether this can be achieved by adjusting the score. An adjustment of Plan D to reduce the cost has been tried, which comes with some criteria scores changed in C3-Sales and C6-Heritage Resilience. The new overall preference is consequently advanced from 66.89 (see Table 7-10) to 67.38 (Table - 13), which also makes the gap bigger between the first rank and the second. The sensitivity analysis demonstrates a way for adjusting and improving the preferred plan, so that it is more practicable and advantageous to the decision maker, as the implementation stage (e.g., developing action plan) will inevitably encounter some unpredictable challenges or assessment deviation that makes the adjustment necessary.

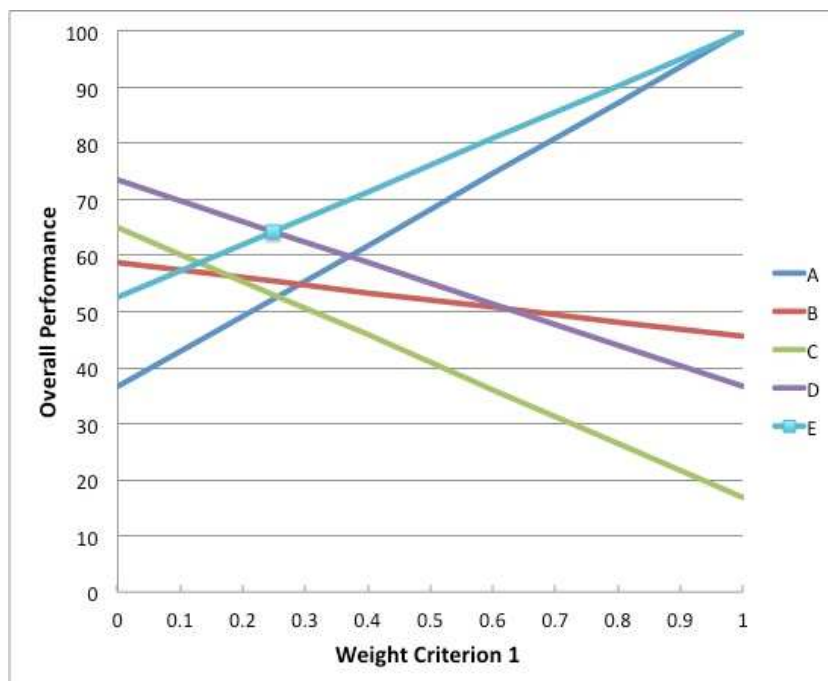


Figure 7-11. Sensitivity analysis targeting the weight of C1.

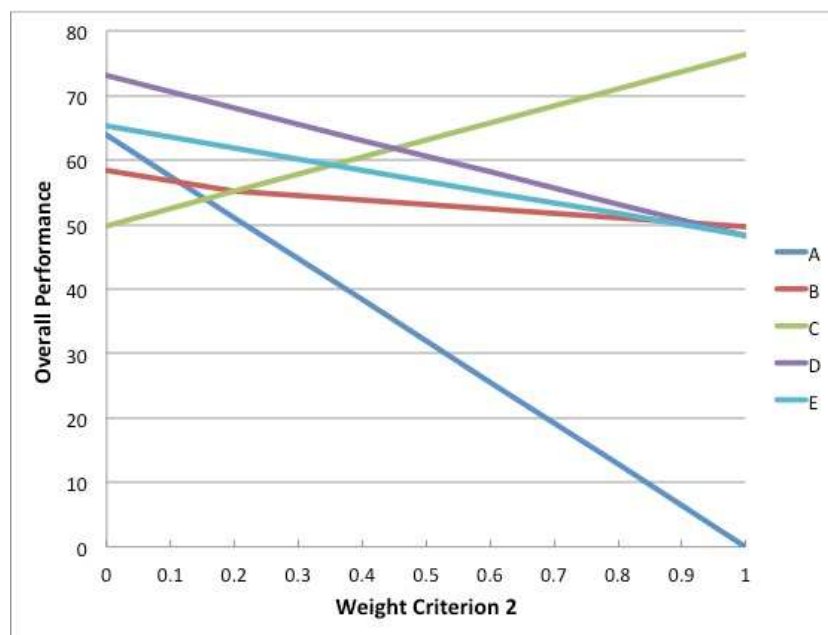


Figure 7-12. Sensitivity analysis targeting the weight of C2.

Table 7-13. The analysis after adjusting the cost/budget of Plan D.

Global scaling

Plan	C1 Cost	C2 BOD left	C3 Sales	C4 Employment	C5 Heritage Sustainability	C6 Heritage Resilience	Overall Value	Ranking
A	0	7650	83,300,000	7	1	2	47.90	5
B	3,269,000,000	3850	83,300,000	7	3	4	56.31	4
C	4,991,000,000	1800	83,300,000	7	3	3	56.44	3
D	1,900,000,000*	3950	68,000,000*	6	9	6*	67.38*	1
E	10,000,000	3950	58,400,000	3	6	4	61.04	2

* Changed values.

7.4 Conclusions

Existing literature concerning MCDA is still scarce in considering how it can be enhanced by drawing on methods and practice from other disciplines. Whilst the results of the research provide insight into the integration of scenario forecasting (i.e., CVM) and MCDA, particularly with the underlying support from the developed matrix approach. The primary objective of this chapter is to provide a practical recommendation for tackling the complex environmental problem of Daxi, where a cultural heritage and the natural environment, both of which are considered worth protection (with WTP estimate of 128,700,000 USD from the public), are at odds with each other. The WTP estimate also manifests the significance of the

‘context’ of the matrix proposed, as without it the government can by no means make any step to tackle the environmental problem.

The preferred plan applies multiple policy instruments—regulatory instrument used to ban polluting discharge, economic instrument utilised to subsidise the legalisation of the polluters—and still follows polluter-pays principle regarding the treatment costs. The finding is that the recognition of the cultural heritage of Daxi indeed affects the selection of policy instruments, shifting from an absolute polluter-pays principle to a softer status mixed with the government-pays basis. The estimation towards the changes in sales and market caused by policy implementation also shows the demand for and advantage of scenario forecasting in MCDA and decision-making support in the future. Also, importantly, the proposed MCDA highlights its participatory feature supported by key steps, in particular the intervention prospective, the scenario forecasting and the sensitivity analysis. The method of employing WTP to obtain the relationship between sales and price does require room to improve, yet the attempt may be of value in stimulating more discussion on wider application of CVM. In addition, notwithstanding the analysis can be a reference for local government with regards to the solution of this complex environmental problem, a new WTP survey officially conducted by the government with more responses (e.g., lower confidence interval) and better representativeness (e.g., the distribution of respondents) of questionnaire is recommended. A more thoroughly informed survey, with more government instruments supported as well as a better statistic assessment, can considerably benefit the performance of policy decision-making, particularly involving resource allocation and social justice.

Chapter 8 Conclusions and Recommendations

8.1 Conclusions

This thesis develops a framework/methodology for ‘harmonious environmental management of cultural heritage and nature (i.e. water environment particularly)’ through a systematic exploration, from philosophical sphere to theoretical sphere, practical sphere, and at the end application sphere, respectively presented as four parts (also four chapters). The first part of exploration (Chapter 4) echoes the importance of regional pluralism of heritage conservation, which rediscovers a peculiar view towards nature from ancient Chinese. Thereby, the central concept—harmony—behind Chinese cultural heritage is rediscovered, which is applied as the core theme of this research with respect to environmental management. The second part (Chapter 5) investigates the inadequacy of intervention theory, whilst the third part (Chapter 6) seeks to reshape the current paradigm of HIA conduction so as to simultaneously and substantially improve change management in theory and practice sphere. The last part (Chapter 7) explores conflicts and contests between cultural heritage and nature with a real case of complex environmental problem and develops a participatory MCDA method particularly strengthened by scenario forecasting with the stated preference method (i.e. economic valuation method). The proposed method supports decision-making particularly involving cultural heritage that features ever-changing social context and often needs scenario forecasting for predicting the dynamic social impacts of proposed plans, which exactly echoes the significance of the ‘context’ of the matrix perspective proposed in Chapter 5.

In Chapter 4, the study employs a case study of Huaqing Palace of Tang in order to explore the core ideology and value behind Chinese cultural heritage, through offering a window to see how the physical infrastructure and its bathing culture was endowed with the four schools of Chinese thoughts, namely, Buddhism, Taoism, Confucianism, and *I Ching* regarding the views towards nature and mind. It then rediscovers the four schools of thoughts by showing how the ideology and values had forged the nature of Chinese cultural heritage. The key findings of this part are listed as follows:

- I. The four schools of Chinese thought are the philosophies that has forged Chinese cultural heritage and shaped the idea of cultural heritage and heritage conservation. Moreover, through the case study and comprehensive review towards the four

thoughts, the peculiar and prominent views towards nature and mind can hence be seen. These two respects are in fact pointing at one thing—harmony—between people, nature and built world, which manifests harmony is the common central concept of these four thoughts.

- II. Given that harmony is the central concept of the four thoughts that influence the constitution, conceptualisation, and conservation of Chinese cultural heritage, it represents a view that centres on the bond between heritage, context (i.e. people and something made by people) and nature and emphasises on two essential aspects—sustainability and resilience—to accommodate changes.
- III. Notwithstanding such a view (i.e. harmony) has long been rooted in the hearts of Chinese people, it has been mislaid out of Chinese modern heritage conservation practice, of which the paradigm presents a tendency to follow ‘universalised’ idea of heritage and conservation practice. It therefore is urgent that the view and wisdom should be recalled and acknowledged first, before a comprehensive protection of heritage value can be achieved.
- IV. The findings of the design concepts and techniques applied in the baths of Huaqing Palace (e.g. the design of inlet and outlet, please see the third point of Section 3.3.2) provide an advanced understanding of the heritage, in particular through the viewpoint of water (engineering).
- V. The additional finding of Chinese ‘sustainability’ discourse, compared with the latest conservation discourse of modern conservation, presents some interesting parallels. It may worth further exploration and observation for future heritage studies, particularly the modern heritage conservation is going towards more philosophical exploration.

In the second and third part of the study, the theoretical and practical issues regarding intervention and change are systematically investigated in Chapter 5 and 6 respectively.

Chapter 5 develops a new perspective of intervention theory so as to turn the harmony concept derived from Chapter 4 into theoretical and practical outcomes, through a further exploration towards water heritage, as well as towards the confined view on the setting and landscape in heritage conservation by examining the practice and charters of international level. Overall, there are four important findings as follows:

- I. Water heritage is prone to be overlooked in heritage conservation, or prone to draw attention merely from its tangible part as architectural heritage, whilst it widely exists in the world and features more dimensions involved (e.g. tangible, intangible, natural, ecological, social and economic). The chapter discussed how it is currently treated in global heritage conservation systems and provides further understanding with its classification.
- II. Notwithstanding landscape features the combination and interaction of nature and human activities, it has over-emphasised the aesthetic sphere in heritage conservation. In terms of the idea of setting, landscape still plays a role that merely gives concern to the aesthetic harmony between heritage and the surrounding environment, revealing that the values from intangible elements, nature, and people are all excluded and overlooked by the current dominant idea of heritage.
- III. Notwithstanding cultural landscape approach addresses exactly what the missing points are towards the confined idea of the setting and landscape, through a way of implicit doctrinaire text it is hardly practicable to many. Therefore, a better way (of thinking) to guide users to rethink the idea of intervention is urgent and necessary.
- IV. Given the current intervention theory was narrowly developed in considering merely physical conditions of heritage, it does not fulfil the demands and challenges of heritage management in present time. Through the assistant elucidation by water heritage that features multiple dimensions involved, the chapter proposed a matrix perspective of intervention that presents an inclusive object covering heritage, context and nature.

In the development of the new intervention perspective, the research points out six shortcomings that the values-based minimal intervention approach has led to the current narrow view of intervention:

- 1) Contemporarily-perceived and ever-changing character;
- 2) Neglect of the (dynamic) condition of associated carriers;
- 3) Tendency of authorised sectionalism;
- 4) Lack of consideration in risk and uncertainty;
- 5) Neglect of indirect and cumulative impact; and
- 6) Dissonant effects between heritage, context and nature.

In response to the six shortcomings, the proposed matrix perspective also gives a

comprehensive consideration in value, sustainability and resilience aspect, as the second dimension, which can be the necessary complement to the current values-based consideration regarding intervention, as well as a participatory approach highlighted in recent practice. The two-dimensional matrix form is expected to guide user's thinking, rather than the current approaches, which mostly lack of consideration in how to transform doctrinal texts into values system of users' mind. In other words, it is hard to translate those rhetoric into action.

In Chapter 6, in order to explore the causes of the current HIA paradigm that presents AHD phenomenon and the incompatibility within EIA, so as to find a solution for improvement, through the discussions of challenges in conduction and the investigation towards the statutory system of the five representative nations, an add-on discourse that has been misleading HIA ever since the creation of HIA is revealed, summarised as follows:

- I. The finding indicates the key systemic problems of the current HIA paradigm (i.e. HIA under EIA-based Framework):
 - 1) Screening process of EIA incompatible with HIA
 - 2) Distinctions of scoping between EIA and HIA
 - 3) Idea of resource and compensation in EIA
 - 4) Unfavourable to community involvement
 - 5) Disconnection natural environment from cultural heritage
 - 6) Disadvantageous to building supervisory and appeal system
 - 7) Ignorance of monitoring and post-evaluation in EIA framework
- II. Through the discussions towards the systemic problems and statutory system, they manifest that in spite of goodwill, the add-on discourse of HIA in EIA has led to adverse outcomes in performance rather than a simultaneous protection of nature and culture. In order to achieve harmonious performance in the simultaneous protection, the finding indicates that an appropriate independence of HIA from EIA in statutory system is necessary.
- III. More importantly, the discourse and AHD can reinforce with each other, which implies the only way to improve HIA is to simultaneously tackle these two discourses, by one hand to separate HIA from EIA framework, and by the other hand to develop a different HIA approach that is inclusive and comprehensive against AHD. Through the assistant elucidation by a water heritage case, as well as

the introduction of the proposed intervention matrix perspective from Chapter 5, it then further proposed a new HIA framework.

Chapter 7 tackles an environmental complex problem involving cultural heritage and manifests the applicability of the proposed matrix perspective of Chapter 5. It develops a participatory decision-making support method and carries out a case study with the application of the proposed method. According to the results, there are four major findings are revealed as below:

- I. This research underlines the deficiency of attention to environmental complex problems that are particularly demanding in adequate scenario forecasting, in the development of decision-making methods. The proposed MCDA with the support of the stated preference technique demonstrates its ability and practicability in scenario forecasting for accommodating changes in context, of which the participation of the public accounts for the most critical part of the ‘participatory’ process in this case.
- II. The proposed MCDA not only combines Contingent Valuation Method for scenario forecasting, but also merges the concept of cost-utility analysis and the intervention perspective (proposed from Chapter 5) into the value tree (of MCDA). The latter part has shown its potential to benefit the performance of criteria proposal. The intervention matrix perspective derived from heritage theory has shown its strength in comprehensive consideration emphasising the harmonious relationships between heritage, context (people, the setting, and society) and nature. The combination of these approaches makes the proposed method particularly suitable to environmental complex problems involving cultural heritage and nature, which highlights viewing heritage conservation in a broader context—being interdependent with natural environment and human activities.
- III. The amount of WTP to tackle the pollution of Daxi togan production reveals that Taiwanese people consider Daxi togan as an important cultural heritage or the crucial part of Daxi cultural heritage rather than merely a traditional food. The information from this finding can be a critical reference to the local government, which helps the proposal of policy instruments and increases the possibility of harmonious resolution (i.e. protecting Daxi togan industry and nature environment simultaneously). The WTP estimate also manifests the significance of the ‘context’

of the matrix proposed, as without it the government can by no means make any further step to tackle the environmental problem.

- IV. Moreover, the relationship between sales and price also derived from the stated preference method has shown its potential in scenario forecasting. It has proved the increase price/cost is indeed a critical factor that reflects sales performance prominently. It once again reflects the significance of the ‘context’. Without this information, neither the scenario forecasting can be made, nor the criteria of the MCDA case can well represent the necessary consideration of this decision-making task.

In summary, the author seeks to provide a comprehensive and holistic view with respect to managing change for environmental management, particularly involving cultural heritage and nature, which is still scarce in literature so far, in particular with interdisciplinary exploration between heritage conservation and environmental protection domain. The research encompasses holistic spheres, including philosophy (ancient Chinese view of harmony), theory (minimal intervention), practice (HIA), and application (the decision-making support for tackling Daxi environmental dilemma), and covers relevant issues at international, national, and local level. Several novelties can therefore be seen, which include the rediscovery of the four thoughts regarding ancient Chinese heritage (in Chapter 4), the cause of obstacle of minimal intervention theory to catch up the current revolution of heritage conservation, as well as a proposed intervention approach featuring matrix thinking (in Chapter 5), the initiative of separation and independence of HIA from EIA towards global practice, which is expected to be the only chance to fundamentally break through the confining multiple discourses (in Chapter 6), and the proposed decision-making support featuring participatory process and scenario forecasting echoing the proposed matrix approach, as well as a breakthrough towards a real environmental dilemma through the proposed method (in Chapter 7). Also, importantly, the whole thesis employs and highlights the significance of water heritage, which expects to not only provide a further understanding of water heritage in heritage conservation, but also give a different and scarce lens to view heritage as well as the bond between people, built world and nature.

8.2 Limitations and Recommendations

With limited time and resource for conducting this interdisciplinary research, the author

expects there exists lot of room to improve the outcome of the research, whilst the author sincerely hopes to use this research to stimulate and encourage more discussions in these relevant issues, not only for enhancing the communication between heritage conservation and environmental protection, but also for contributing to the harmony of cultural heritage and nature.

Given the limitations and shortcomings of this thesis, further studies of corresponding aspects are required to tackle the remaining challenges and deficiency and achieve more improvements in environmental management involving cultural heritage in the future.

For the first part (Chapter 4)—regional pluralism and the core concept of human-nature harmony in cultural heritage, the author hopes the limited finding could be an enlightenment to modern Chinese, who should resurrect the wisdom of ‘oneness of nature and human’ of the past, as well as the inner nature of pursuing and practicing the wisdom as one of the top priorities of life, so that the everlasting values will no longer be mislaid due to the intention of economic development. The future developments are proposed and listed below:

- I. In terms of the influence of the four Chinese philosophies and the central concept of harmony, they seem to have affected and shaped values of ancient Chinese and their descendants towards the idea of heritage and heritage conservation. It is hence worth to further investigate what is the peculiar and common values left so far, and what is the reason to cause the loss or ignorance of them, through more case studies of field investigation particularly with interviews with living heritage communities, in order to better understand and protect this peculiar value system in the future. Furthermore, it is also encouraged to further constitute and propose regional perspectives or approaches in heritage conservation or heritage studies, in local/national or international level.
- II. As to water heritage, given ancient Chinese possessed a peculiar view on nature and the relationship between human and nature, it is worth to further explore what is the common specialities and characteristics of Chinese water heritage, what is the peculiar ideologies behind the design, construction, operation, maintain, and sustainable reuse of the heritage, and what is the difference in the idea of sustainability, through systematic and comprehensive investigations on a variety of water heritages. It is expected to be of merit to the constitution of modern water infrastructure, particularly in terms of sustainable development and ecosystem harmony.

- III. The additional finding regarding the parallels between the ancient Chinese ‘sustainability’ discourse and the latest ‘Heritage Planning’ discourse may be way beyond the expectation of many. It seems more discussion from philosophy sphere results in more similarity, which therefore worth further research in the future.

For the second part (Chapter 5), there are two respects that can be further explored for future studies in intervention theory and water heritage, as follows,

- I. Apart from the introduction of the temporal viewpoint (i.e. sustainability aspect) and risk viewpoint (i.e. resilience aspect) that are proposed as the additional consideration aspects in intervention, the proposed perspective of intervention can be refined through further exploring other viewpoints and aspects, and discussing whether the value aspect is still appropriate to work with the two aspects or should be broken down and replaced by some more specific and detailed aspects, from relevant issues of real cases in practice, so as to further enhance the perspective proposed in terms of comprehensive consideration.
- II. Since it seems infeasible to apply water heritage as a category in current heritage management and conservation practice (e.g. planning system, designation system, statutory requirements, and international charters) due to the incompatibility with the existing categorical principle, how to promote and attract more attention to water heritage without conflicting the existing categorization is another meaningful task in heritage studies.

For the third part (Chapter 6)—HIA, some potential ways are available to further improve the understanding of the challenges of HIA conduction, as followed:

- I. It is expected that the discussions in legislation and administrative system of Chapter 6 can be refined by interviewing the practitioners of those selected countries, along with the analysis of difficulties and issues in HIA implementation of mass local cases.
- II. Moreover, since it is noticeable that there exist prominent incompatibility and gaps between HIA legislation system and national practice of heritage conservation, which reveals the divergence between the viewpoint of legislation and the viewpoint of heritage conservation, it should be of merit to explore how to better

employ legislation system to fulfil the demands of conservation and management of cultural heritage.

For the last part (Chapter 7), there are four aspects that can be explored for further studies in decision-making support methods involving cultural heritage and nature.

- I. The approach for deriving the relationship between sales and prices is a critical part of scenario forecasting in Chapter 7. There exist a variety of approaches in economics and relevant fields. Further comparative studies of different approaches are worth pursuing, in order to improve the performance of scenario forecasting. Moreover, the case study applied in the chapter features a competitive relationship between local industry (Daxi togan industry) and regional market (Taiwan). It represents a special economic circumstance, whilst it is of merit due to extensive application potential nowadays in similar types of issue, for instance, regional pollution affecting the sales of a product of the region.
- II. Notwithstanding the WTP analysis can be reference to local government with regard to the resolution of the complex problem, a new WTP survey with more responses of questionnaire is recommended due to the deficiency of survey outcomes of this research, as a better confidence level and interval of statistical analysis can improve the performance of policy changing, especially in resource allocation of controversial circumstance.
- III. As acknowledged that different approaches of the stated preference technique suitable for different problems and situations, it is strongly recommended to employ other approaches or comparative studies to verify the adequacy of applying CVM in this case, particularly in terms of the performance of scenario forecasting. Similarly, comparative studies of different MCDA approaches are also beneficial to the verification of adequacy of selecting this MCDA approach in this case.
- IV. In terms of policy instruments, this research can be refined through interviewing the local governors (e.g. the authority of water resource and of cultural heritage) and other stakeholders (e.g. heritage community, the local public), so as to perform better analysis in policy instruments with better understanding of difficulties, demands and resources from different aspects and stakeholders. In addition, it can also be beneficial to the improvement of the participatory sphere of the proposed MCDA.

Appendix A. Water-related Techniques Applied in the Baths Excavated

Name	User	Construction Period	Pool Surface Material	Outer Waterproof Layer	Inlet	Outlet	Other Feature and Description
Stars Thermae	Emperors before Xuanzong of Tang	The Western Zhou Dynasty	Slate Masonry	Wall: Cord-patterned Brick + Stone Masonry Bottom: Cord-patterned Brick + Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring gushing from the Bottom	Masonry and Brickwork Open Channel, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● After the Construction of Lotus Thermae, Stars Thermae Was Used as a Reservoir, Supplying Water to Prince Thermae, Shangshi Thermae, and Yichun Thermae ● Exhibition
Lotus Thermae	Emperor Xuanzong of Tang	Emperor Xuanzong of Tang	Slate Masonry	Wall: Cord-patterned Brick Bottom: Rammed Earth	Masonry and Brickwork Conduit Beneath, Hot Spring Gushing from the Bottom	Sinkhole at the Bottom of a Wall, Connected with Underground Masonry Conduit, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Exhibition
Begonia Thermae	Consort Yang	Emperor Xuanzong of Tang	Slate Masonry	Wall: Cord-patterned Brick Bottom: Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring Gushing from the Bottom	Sinkhole at the Bottom of a Wall, Connected with Underground Male-female Pottery Pipes and Masonry Conduit, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Exhibition ● The Water Was Supplied by Lotus Thermae
Prince Thermae	Princes of Tang from Emperor Taizong to Xuanzong	Unknown, Reconstruction during Emperor Taizong of Tang	Slate Masonry	Wall: Cord-patterned Brick + Stone Masonry Bottom: Cord-patterned Brick + Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring Gushing from the Bottom of a Wall	Masonry Open Channel, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Abandon during the Palace Reconstruction of Xuanzong of Tang ● Serious Destruction ● Exhibition
Shangshi Thermae	Close Officials	Emperor Xuanzong of Tang	Slate Masonry	Bottom: Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring Gushing from the Bottom	Sinkhole at the Bottom of a Wall, Connected with Underground Masonry Conduit, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Exhibition
Yichun Thermae	Women in the Palace	Emperor Xuanzong of Tang	Slate Masonry	Wall: Cord-patterned Brick Bottom: Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring Gushing from the Bottom	Unknown	<ul style="list-style-type: none"> ● Serious Destruction ● Backfill after Archaeology Excavation
No.1 Unknown Thermae	Unknown	Unknown, probably as early as Stars Thermae	Stone Masonry	Wall: Stone Masonry Bottom: Rammed Earth	Masonry Open Channel	Brickwork Open Channel, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Abandon during the Palace Reconstruction of Xuanzong of Tang ● Serious Destruction ● Backfill after Archaeology Excavation
No.2 Unknown Thermae	Unknown	Unknown, Probably as Early as the Northern Wei Period	Slate Masonry	Bottom: Stone Masonry	Unknown Approach with Pottery Pipes	Brickwork Open Channel	<ul style="list-style-type: none"> ● Abandon during the Palace Reconstruction of Xuanzong of Tang ● Serious Destruction ● Backfill after Archaeology Excavation
Mt. Li Thermae of Qin and Han	Emperors of Qin and Han	Emperor Qin Shi Huang	Wall: Brick Bottom: Slate Masonry	Wall: Stone Masonry + Rammed Earth Bottom: Brick + Rammed Earth	Masonry Open Channel	Masonry Open Channel, with Slate Weir for Water Level Control	<ul style="list-style-type: none"> ● Backfill after Archaeology Excavation
Small Thermae (Pear Orchard)	Artists of Pear Orchard	Emperor Xuanzong of Tang	Slate Masonry	Bottom: Rammed Earth	Male-female Pottery Pipes Beneath, Hot Spring Gushing from the Bottom of a Wall	Sinkhole at the Bottom of a Wall, Connected with Underground Masonry Conduit, with Slate Weir for	<ul style="list-style-type: none"> ● Plan to Restore

Name	User	Construction Period	Pool Surface Material	Outer Waterproof Layer	Inlet	Outlet	Other Feature and Description
						Water Level Control	

Appendix B. The Facility Type and Water Issue of Water World Heritage

Heritage Name	States	Facility Type	Water Issue
Butrint	Albania	Roman aqueduct, Roman bath, Roman well	
Timgad	Algeria	Roman bath, underground reservoir, drainage and sewage system	
Jesuit Block and Estancias of Córdoba	Argentina	Hydraulic systems (breakwaters, irrigation ditches, canals)	
Andean Road System	Argentina	Roadside ditches, sewage pipes, drains	
Willandra Lakes Region	Australia	An archaeologic evidence of the way early people interacted with water environment	An exceptional testimony of the exploitation of fresh water resources to human development
Qal'at al-Bahrain – Ancient Harbour and Capital of Dilmun	Bahrain	Harbour	
Pearling, Testimony of an Island Economy	Bahrain	Pearling industry	
Historic Mosque City of Bagerhat	Bangladesh	Cisterns, reservoirs, bridges	
The Four Lifts on the Canal du Centre and their Environs, La Louvière and Le Roeulx (Hainaut)	Belgium	Hydraulic boat-lifts	
City of Potosí	Bolivia (Plurinational State of)	Aqueducts, artificial lakes, hydraulic mills for silver mine	
Tiwanaku: Spiritual and Political Centre of the Tiwanaku Culture	Bolivia (Plurinational State of)	Inca underground drainage	
Old Bridge Area of the Old City of Mostar	Bosnia and Herzegovina	Bridge	
Mehmed Paša Sokolović Bridge in Višegrad	Bosnia and Herzegovina	Bridge	Risk from the use of the two hydro-electric power stations affecting the water levels of the river
Angkor	Cambodia	Hydraulic system (basins, dykes, reservoirs, canals)	
Rideau Canal	Canada	Slackwater canal for military purpose	
Landscape of Grand Pré	Canada	Hydraulic system of dykes, Aboiteaux (sluice gate) and a drainage network	
Red Bay Basque Whaling Station	Canada	Whaling Station and underwater remains	
Old Town of Lijiang	China	Water-supply system (waterway, canal) and bridge	
Classical Gardens of Suzhou	China	Water-supply system (waterway, canal) and bridge	
Mount Qingcheng and the Dujiangyan Irrigation System	China	Irrigation system	
Ancient Villages in Southern Anhui – Xidi and Hongcun	China	Water-supply system (waterway, canal)	
Cultural Landscape of Honghe Hani Rice Terraces	China	Springs and a complex system of channels for irrigation and living	

Heritage Name	States	Facility Type	Water Issue
Yin Xu	China	Defensive ditch, also for flood control	
West Lake Cultural Landscape of Hangzhou	China	Lake cultural landscape	
Site of Xanadu	China	Floodwall, flood discharge ditch, drainage	
The Grand Canal	China	Inland waterway system	
Port, Fortresses and Group of Monuments, Cartagena	Colombia	Harbour and commercial maritime routes	
Historic Town of Grand-Bassam	Côte d'Ivoire	Port cultural landscape	
Stari Grad Plain	Croatia	Rainwater recovery system	
Kronborg Castle	Denmark	Water gateway and shipyard	
Rock-Hewn Churches, Lalibela	Ethiopia	An extensive drainage system for underground rock building	Drainage ditches disrupted by seismic activity resulting in a severe degradation from water damage
Fasil Ghebbi, Gondar Region	Ethiopia	Bathing palace	
Konso Cultural Landscape	Ethiopia	Water reservoir	
Pont du Gard (Roman Aqueduct)	France	Roman Aqueduct	
Canal du Midi	France	Canal including locks, aqueducts, bridges, tunnels	
The Causses and the Cévennes, Mediterranean agro-pastoral Cultural Landscape	France	Watercourse	
Bordeaux, Port of the Moon	France	Harbour	
Maulbronn Monastery Complex	Germany	Water-management system (network of drains, irrigation canals and reservoirs)	
Mines of Rammelsberg, Historic Town of Goslar and Upper Harz Water Management System	Germany	Water-management systems for mining	
Bergpark Wilhelmshöhe	Germany	Monumental water structures landscape	
Speicherstadt and Kontorhaus District with Chilehaus	Germany	Waterways of port	
Medieval City of Rhodes	Greece	Baths	
Pythagoreion and Heraion of Samos	Greece	Aqueduct	
Tikal National Park	Guatemala	Mayan historic water reservoirs (aguadas and chultun) for overcoming low surface water caused by karst nature and extreme dry/wet climate	
Hortobágy National Park - the <i>Puszta</i>	Hungary	Wetland	
Red Fort Complex	India	Monumental water channel (Nahr-i-Behisht)	
Humayun's Tomb, Delhi	India	Water garden	

Heritage Name	States	Facility Type	Water Issue
Group of Monuments at Hampi	India	Step tank, water channels	
Hill Forts of Rajasthan	India	Water harvesting structures	
Taj Mahal	India	Water garden	
Rani-ki-Vav (the Queen's Stepwell) at Patan, Gujarat	India	Stepwell (for extreme climate)	The altered ground water levels
Champaner-Pavagadh Archaeological Park	India	Water retaining installations (for extreme climate)	
Cultural Landscape of Bali Province: the <i>Subak</i> System as a Manifestation of the <i>Tri Hita Karana</i> Philosophy	Indonesia	Irrigation system including water temple	
Bam and its Cultural Landscape	Iran (Islamic Republic of)	Underground canals for a desert environment (qanat)	
Shushtar Historical Hydraulic System	Iran (Islamic Republic of)	Diverse hydraulic system for urban water supply, mills, irrigation, river transport, and defensive system	
The Persian Garden	Iran (Islamic Republic of)	Water-management system for garden	
Cultural Landscape of Maymand	Iran (Islamic Republic of)	Qanat water system	
Masada	Israel	Rain collecting system	
Old City of Acre	Israel	Baths	
Incense Route - Desert Cities in the Negev	Israel	Water collection and irrigation system for large-scale agriculture including dams, channeling, cisterns and reservoirs	
Biblical Tels - Megiddo, Hazor, Beer Sheba	Israel	Underground water-collecting system	
Caves of Maresha and Bet-Guvrin in the Judean Lowlands as a Microcosm of the Land of the Caves	Israel	Underground chambers served as cisterns, baths	
Venice and its Lagoon	Italy	Water city	Risk from high level of water and flooding
18th-Century Royal Palace at Caserta with the Park, the Aqueduct of Vanvitelli, and the San Leucio Complex	Italy	Aqueduct	
Ferrara, City of the Renaissance, and its Po Delta	Italy	Drainage and waterway	
Archaeological Areas of Pompei, Herculaneum and Torre Annunziata	Italy	Baths and aqueduct	
Petra	Jordan	Water distribution and storage system (diversion dam, Muthlim tunnel, water channels, aqueducts, reservoirs and cisterns)	
Quseir Amra	Jordan	Agricultural water catchment works, baths with its adjacent well, tank and water-lifting hydraulic system, drainage pipes and cesspool	Flooding risk
Um er-Rasas (Kastrom Mefa'a)	Jordan	Water channels and cisterns	

Heritage Name	States	Facility Type	Water Issue
Wadi Rum Protected Area	Jordan	A desert cultural landscape containing water catchment systems documenting the settlements of successive communities	
Vat Phou and Associated Ancient Settlements within the Champasak Cultural Landscape	Lao People's Democratic Republic	Waterworks	
Anjar	Lebanon	Baths	
Archaeological Site of Leptis Magna	Libya	Port	
Historic Centre of Mexico City and Xochimilco	Mexico	Canal and Chinampas system (floating farm)	The Chinampas agricultural system threatened by excessive groundwater extraction
Earliest 16th-Century Monasteries on the Slopes of Popocatepetl	Mexico	Hydraulic structures for conduction water	
Pre-Hispanic Town of Uxmal	Mexico	Hydraulic works chultunoob (storing rainwater)	
Archaeological Monuments Zone of Xochicalco	Mexico	A complex water system including rainwater cistern	
Ancient Maya City and Protected Tropical Forests of Calakmul, Campeche	Mexico	Mayan historic water reservoirs (aguadas and chultun) for overcoming low surface water caused by karst nature and extreme dry/wet climate	
Aqueduct of Padre Tembleque Hydraulic System	Mexico	Hydraulic system including springs, main and secondary canals, distribution tanks, several arcaded aqueduct bridges, reservoirs	
Medina of Marrakesh	Morocco	Menara water garden	
Medina of Essaouira (formerly Mogador)	Morocco	Harbour	
Portuguese City of Mazagan (El Jadida)	Morocco	Cistern	
Pyu Ancient Cities	Myanmar	Canals and water tanks	
Kathmandu Valley	Nepal	Step wells (hitis)	
Historic Area of Willemstad, Inner City and Harbour, Curaçao	Netherlands	Harbour	
Seventeenth-Century Canal Ring Area of Amsterdam inside the Singelgracht	Netherlands	Harbour and cannel network	
Røros Mining Town and the Circumference	Norway	Water management system for mining	
Rjukan–Notodden Industrial Heritage Site	Norway	Hydro-electric power plants	
Bahla Fort	Oman	Falaj system	
Aflaj Irrigation Systems of Oman	Oman	Falaj system	
Fort and Shalamar Gardens in Lahore	Pakistan	Water garden	
Rohtas Fort	Pakistan	Baolis (stepped wells)	
Rock Islands Southern Lagoon	Palau	Human settlement in marine lagoon environment	
Palestine: Land of Olives and Vines – Cultural	Palestine	Irrigation water system fed by underground sources	

Heritage Name	States	Facility Type	Water Issue
Landscape of Southern Jerusalem, Battir			
Historic Sanctuary of Machu Picchu	Peru	Surface and subsurface drainage, waterway	Heavy rainfall caused landslide risk
Garrison Border Town of Elvas and its Fortifications	Portugal	Amoreira Aqueduct	
Hwaseong Fortress	Republic of Korea	Floodgate	Flooding risk
Al-Hijr Archaeological Site (Madâin Sâlih)	Saudi Arabia	Water wells for agriculture	
Saloum Delta	Senegal	Shellfish mounds	
Old Town of Segovia and its Aqueduct	Spain	Roman aqueduct	
Archaeological Ensemble of Mérida	Spain	Roman aqueducts and water-supply system	
Aranjuez Cultural Landscape	Spain	Watercourses and water garden	
Vizcaya Bridge	Spain	High suspended gondola bridge	
Cultural Landscape of the Serra de Tramuntana	Spain	Waterworks network and qanat system	
Archaeological Sites of the Island of Meroe	Sudan	Reservoir	
Naval Port of Karlskrona	Sweden	Naval port	
Old City of Berne	Switzerland	Water transportation	
Ancient Villages of Northern Syria	Syrian Arab Republic	Cisterns, bathhouse	
Historic Town of Sukhothai and Associated Historic Towns	Thailand	Water supply system, flooding control	
Historic City of Ayutthaya	Thailand	Hydraulic system for water management, including canals and moat	Flooding risk
Medina of Sousse	Tunisia	Commercial and military harbor	
Kairouan	Tunisia	Cisterns and water supply system	
Hattusha: the Hittite Capital	Turkey	Artificial water ponds	
Hierapolis-Pamukkale	Turkey	Hotspring bath	
Pergamon and its Multi-Layered Cultural Landscape	Turkey	Water supply system	
Ancient City of Tauric Chersonese and its Chora	Ukraine	Water supply system	
Cultural Sites of Al Ain (Hafit, Hili, Bidaa Bint Saud and Oases Areas)	United Arab Emirates	Water supply system (afaj)	
Ironbridge Gorge	United Kingdom of Great Britain and Northern Ireland	First bridge constructed of iron	
Studley Royal Park including the Ruins of Fountains Abbey	United Kingdom of Great Britain and Northern Ireland	Water garden	

Heritage Name	States	Facility Type	Water Issue
St Kilda	United Kingdom of Great Britain and Northern Ireland	Archipelago marine cultural landscape	
New Lanark	United Kingdom of Great Britain and Northern Ireland	Weir, lade and waterways providing water-power to the cotton mills	
Historic Town of St George and Related Fortifications, Bermuda	United Kingdom of Great Britain and Northern Ireland	Rainwater collection roof	
Blaenavon Industrial Landscape	United Kingdom of Great Britain and Northern Ireland	Water balance tower for lifting	
Derwent Valley Mills	United Kingdom of Great Britain and Northern Ireland	Waterpower for cotton mills	
Liverpool – Maritime Mercantile City	United Kingdom of Great Britain and Northern Ireland	Commercial port	
The Forth Bridge	United Kingdom of Great Britain and Northern Ireland	The world's earliest and longest multispan cantilever bridge	
Papahānaumokuākea	United States of America	Marine cultural landscape of small islands	
San Antonio Missions	United States of America	Water distribution systems	
Trang An Landscape Complex	Viet Nam	Cultural landscape showing how human adapted to major climatic and water environmental changes (sea level)	
Tassili n'Ajjer	Algeria	Cultural landscape showing how human adapted to major water environmental changes and desertification	
Prehistoric Pile dwellings around the Alps	Austria, France, Germany, Italy, Slovenia, Switzerland	Pile-dwelling	
Silk Roads: The Routes Network of Chang'an-Tianshan Corridor	China, Kazakhstan, Kyrgyzstan	Water management system, qanat (karez) system	
Archaeological Landscape of the First Coffee Plantations in the South-East of Cuba	Cuba	Infrastructure for irrigation and water management	
Verla Groundwood and Board Mill	Finland	Water power plants	
Historic Centre of Rome, the Properties of the Holy See in that City Enjoying Extraterritorial Rights and San Paolo Fuori le Mura	Holy See, Italy	Water systems including drainage, aqueducts, fountains, and the 19th-century flood walls	
Schokland and Surroundings	Netherlands	Land reclaimed from the sea	
Defence Line of Amsterdam	Netherlands	Defence system by controlling the waters	
Mill Network at Kinderdijk-Elshout	Netherlands	Hydraulic works for the drainage of land for agriculture and settlement	
Ir.D.F. Woudagemaal (D.F. Wouda Steam Pumping Station)	Netherlands	Pumping station	
Droogmakerij de Beemster (Beemster Polder)	Netherlands	Reclaimed land by the draining of lake; waterways	
Chan Chan Archaeological Zone	Peru	Water management system	Risk from the rising water table levels

Heritage Name	States	Facility Type	Water Issue
Rice Terraces of the Philippine Cordilleras	Philippines	Water distribution system	
Ancient City of Sigiriya	Sri Lanka	Water garden	
City of Bath	United Kingdom of Great Britain and Northern Ireland	Roman baths	Springs affected by pathogenic amoebae

Appendix C. Non-water World Heritage with Water Issue

Heritage Name	States	Water Issue
Historic Centre of the City of Salzburg	Austria	Flooding risk
Wachau Cultural Landscape	Austria	Flooding risk
Historic Centre of Vienna	Austria	Flooding risk
Historic Centre of the Town of Olinda	Brazil	Foundation threatened by rising groundwater levels and poor sewage drainage system
Rio de Janeiro: Carioca Landscapes between the Mountain and the Sea	Brazil	Water pollution around Guanabara Bay
Madara Rider	Bulgaria	Heavy rain and melting snow causing erosion to rocks
Ancient Building Complex in the Wudang Mountains	China	Modern water diversion causing local water level to rise 15 meters affecting some ancient buildings
Mount Wuyi	China	The water and soil loss caused by the increased tea production activities of inhabitants; the impacts from domestic sewage and solid waste on the water quality of the Nine-Bend River
Historic Centre of Santa Cruz de Mompox	Colombia	Flooding risk
Coffee Cultural Landscape of Colombia	Colombia	Wastewater pollution
Viñales Valley	Cuba	Reduction of water supply due to climate change
Historic Centre of Prague	Czech Republic	Flooding risk
Historic Centre of Český Krumlov	Czech Republic	Flooding risk
Complex of Koguryo Tombs	Democratic People's Republic of Korea	Threatened by humidity and flooding risk
Nubian Monuments from Abu Simbel to Philae	Egypt	Threatened by the construction of dam
Abu Mena	Egypt	The foundation structure threatened by high level of the water table
Garden Kingdom of Dessau-Wörlitz	Germany	Flooding risk
Bauhaus and its Sites in Weimar and Dessau	Germany	Flooding risk
Luther Memorials in Eisleben and Wittenberg	Germany	Flooding risk
Classical Weimar	Germany	Flooding risk
Asante Traditional Buildings	Ghana	Heavy rain and humid condition
Archaeological Park and Ruins of Quirigua	Guatemala	Flooding risk
Maya Site of Copan	Honduras	Flooding risk
Budapest, including the Banks of the Danube, the Buda Castle Quarter and Andrásy Avenue	Hungary	Extreme water-levels
Sun Temple, Konârak	India	Risk from monsoon rains and flooding

Heritage Name	States	Water Issue
Mountain Railways of India	India	Risk from monsoon rain, landslides
Takht-e Soleyman	Iran (Islamic Republic of)	Risk from the long rainy climate
Pasargadae	Iran (Islamic Republic of)	Flooding risk
Shahr-i Sokhta	Iran (Islamic Republic of)	Abandon because of the diversions in water courses
Historic Centre of Florence	Italy	Flooding risk
Arab-Norman Palermo and the Cathedral Churches of Cefalù and Monreale	Italy	Flooding risk
Mausoleum of Khoja Ahmed Yasawi	Kazakhstan	High water table threatening structure
Petroglyphs within the Archaeological Landscape of Tamgaly	Kazakhstan	Water ingress and high-water table threatening rocks
Hal Saflieni Hypogeum	Malta	Risk from relative humidity levels and water infiltration
Historic Centre of Puebla	Mexico	Flooding risk
Historic Monuments Zone of Tlacotalpan	Mexico	Flooding risk
Orkhon Valley Cultural Landscape	Mongolia	Lowering water table and pollution of watercourses
Historical Monuments at Makli, Thatta	Pakistan	Risk from humidity, heavy rains, and the shift of the riverbed
City of Cuzco	Peru	Heavy rainfall
Chavin (Archaeological Site)	Peru	Risk of flooding and landslide
Historic Centre of Kraków	Poland	Flooding risk
Historic Centre of Warsaw	Poland	Flooding risk
Landscape of the Pico Island Vineyard Culture	Portugal	Desertification and reduced rainfall
Seokguram Grotto and Bulguksa Temple	Republic of Korea	Acid rain
Island of Saint-Louis	Senegal	Risk from development of dams upriver and flooding
Mapungubwe Cultural Landscape	South Africa	Decreased rainfall causing demise
Xanthos-Letoon	Turkey	Risk from seasonal rising of the ground water table
State Historical and Cultural Park "Ancient Merv"	Turkmenistan	Underground water levels rising
Kiev: Saint-Sophia Cathedral and Related Monastic Buildings, Kiev-Pechersk Lavra	Ukraine	Caves requiring a constant monitoring over the hydrogeological conditions
Cahokia Mounds State Historic Site	United States of America	Flooding risk
Monumental Earthworks of Poverty Point	United States of America	Created to prevent flooding in lowland condition
Historic Centre of Bukhara	Uzbekistan	Risk from underground water
Historic Centre of Shakhrisyabz	Uzbekistan	Rising ground water level

Heritage Name	States	Water Issue
Complex of Huế Monuments	Viet Nam	Flooding risk
Hoi An Ancient Town	Viet Nam	Flooding risk
My Son Sanctuary	Viet Nam	Flooding and high humidity
Matobo Hills	Zimbabwe	Droughts and floods
Khami Ruins National Monument	Zimbabwe	Deterioration of water infiltration and groundwater
Fertő / Neusiedlersee Cultural Landscape	Austria, Hungary	Extreme changes of water level
Fortress of Suomenlinna	Finland	Rising sea levels and increased rainfall

Appendix D. Economic Valuation Questionnaire

Daxi is a historic town of Taoyuan City in northern Taiwan, which was voted as the number one hot spot of ‘the top 10 small tourist towns of Taiwan’ in 2012. The town is popular in tourism due to abundant tourist attractions of cultural heritage and scenery spots. The town covers the main part of two water resource conservation areas, namely Shihmen Reservoir and Bansin water resource conservation area, which is considered one of the most important water resource area and catchment in Taiwan. Excellent water quality and nature conditions have made Daxi famous for tea production since the late 18 century, as well as the centenary historic togan production. Plus abundant cultural heritage, including the Daxi Old Street, the Lee Teng-fan's Ancient Residence, Japanese historical architecture Daxi Wude Hall, Daxi Furen Temple, Cihu Mausoleum and Touliao Mausoleum, the significance of culture and tourism of Daxi has been recognised by Taiwanese people.

Q 10. Next, please imagine the situation described below.

The production of Daxi togan has caused an increasing concern of pollution to water resource that supplies tap water to most of the area of New Taipei city and Taoyuan City, whilst the development of togan production has its historical background, meaning the responsibility for pollution is not exactly the fault of the manufacturers. Since togan has become an essential part of cultural heritage of Daxi, as well as an important industry, the local government plans to tackle the pollution problem whilst also maintain the sustainability of the development of the togan industry. Given the difficulty in financial condition of the local government, the funds for the plan would be collected as a tax for five years from all households in Taiwan.

What, in your honest opinion, would be a reasonable maximum amount of **annual tax** your household would be prepared to pay in the five years to deal with the water pollution issue from Daxi, as well as to improve the sustainable development of the Daxi togan industry?

When answering about your household's willingness to pay for the conduct of the resolution, remember that you may prefer to use money for some other project, for example, health care or some other project related to the environment.

Please, select **only one** of the following alternatives.

Annual tax (TWD) for your household:

\$0	\$5	\$15	\$30	\$50	\$75	\$105	\$140	\$180	\$225	\$270	\$350	\$500	\$800	More than \$1300
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Specified amount:

Next, please imagine 5 situations described below. Assuming your family buys **10 bags** of Daxi togan every year,

Q 11. how many bags will you buy if the price of Daxi togan is raised from 50 to 55 TWD per bag (10% increase)?

Q 12. how many bags will you buy if the price of Daxi togan is raised from 50 to 57.5 TWD per bag (15% increase)?

Q 13. how many bags will you buy if the price of Daxi togan is raised from 50 to 60 TWD per bag (20% increase)?

Q 14. how many bags will you buy if the price of Daxi togan is raised from 50 to 75 TWD per bag (50% increase)?

Q 15. how much money per bag are you willing to pay at most for Daxi togan, instead of turning to buy the togan produced by other areas of Taiwan?

\$80	\$90	\$100	\$115	\$130	\$150	\$175	More than \$200
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Specified price:

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